

## **Final Regulation Order**

California Code of Regulations, Title 13, Division 3

### **Chapter 14. Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines**

#### **§ 2700. Applicability.**

These procedures apply to in-use strategies which, through the use of sound principles of science and engineering, control emissions of particulate matter (PM) and oxides of nitrogen (NO<sub>x</sub>) from diesel-fueled diesel engines. These strategies may include but are not limited to, diesel particulate filters, diesel oxidation catalysts, fuel additives, selective catalytic reduction systems, exhaust gas recirculation systems, and alternative diesel fuels. To be verified under these procedures, a strategy must either reduce emissions of PM or both PM and NO<sub>x</sub>. A strategy that reduces emissions of NO<sub>x</sub> alone may be verified only for use with on-road diesel engines certified to a PM emissions standard of 0.01 grams per brake-horsepower hour (g/bhp-hr) or less, or off-road diesel engines certified to a PM emissions standard of 0.03 g/bhp-hr or less. A strategy that reduces emissions of NO<sub>x</sub> alone may be verified for use with other diesel engines provided that they are not regulated by ARB in-use fleet regulations or Airborne Toxic Control Measures that require PM emissions control, or provided that they would otherwise potentially not be retrofit with PM emission control strategies.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, 43105, 43600 and 43700, Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5 Health and Safety Code; and Title 17 California Code of Regulations Section 93000.

#### **§ 2701. Definitions.**

- (a) The definitions in Section 1900(b), Chapter 1, Title 13 of the California Code of Regulations are incorporated by reference herein. The following definitions shall govern the provisions of this chapter:
- (1) "15 ppmw or less sulfur fuel" means diesel fuel with a sulfur content equal to or less than 15 parts per million by weight (ppmw).
  - (2) "Advertise" means to provide any notice, announcement, information, publication, catalog, listing for sale or lease, or other statement concerning a product or service to the public for the purpose of furthering the sale or lease of the product or service.
  - (3) "Alternative Diesel Fuel" means any fuel used in diesel engines that is not commonly or commercially known, sold or represented as diesel fuel No. 1-D or No. 2-D, pursuant to the specifications in ASTM Standard Specification for Diesel Fuel Oils D975-81 and does not require engine or

fuel system modifications for the engine to operate, although minor modifications (e.g. recalibration of the engine fuel control) may enhance performance. Examples of alternative diesel fuels include, but are not limited to, biodiesel, Fischer Tropsch fuels, and emulsions of water in diesel fuel. Natural gas is not an alternative diesel fuel. An emission control strategy using a fuel additive will be treated as an alternative diesel fuel based strategy unless:

- (A) The additive is supplied to the vehicle or engine fuel by an on-board dosing mechanism, or
  - (B) The additive is directly mixed into the base fuel inside the fuel tank of the vehicle or engine, or
  - (C) The additive and base fuel are not mixed until vehicle or engine fueling commences, and no more additive plus base fuel combination is mixed than required for a single fueling of a single engine or vehicle.
- (4) "Approach Light System with Sequenced Flasher Lights in Category 1 and Category 2 Configurations" (ALSF-1 and ALSF-2) mean high intensity approach lighting systems with sequenced flashers used at airports to illuminate specified runways during category II or III weather conditions, where category II means a decision height of 100 feet and runway visual range of 1,200 feet, and category III means no decision height or decision height below 100 feet and runway visual range of 700 feet.
  - (5) "Applicant" means the entity that has applied for or has been granted verification under this Procedure.
  - (6) "Auxiliary Emission Control Device" (AECD) means any device or element of design that senses temperature, vehicle speed, engine revolutions per minute (RPM), transmission gear, manifold vacuum, or any other parameter for the purpose of activating, modulating, delaying, or deactivating the operation of the emission control system.
  - (7) "Average" means the arithmetic mean.
  - (8) "Backpressure Monitor" means a device that includes a sensor for measuring the engine backpressure upstream of a hardware-based diesel emission control system or component thereof installed in the exhaust system and an indicator to notify the operator when the backpressure exceeds specified high and in some cases low backpressure limits, as defined by the engine manufacturer or the applicant for verification of a diesel emission control strategy.
  - (9) "Baseline" means the test of a vehicle or engine without the diesel emission control strategy implemented.
  - (10) "Cold Start" means the start of an engine only after the engine oil and water temperatures are stabilized between 68 and 86 degrees Fahrenheit for a minimum of 15 minutes.
  - (11) "Common ownership fleet" means all off-road and on-road vehicles and stationary engines being owned or managed day to day by the same person, corporation, partnership, or association. Vehicles managed by the same directors, officers, or managers, or by corporations controlled

by the same majority stockholders are considered to be under common ownership or control even if their title is held by different business entities. For purposes of this regulation, on-road, off-road vehicles and stationary engines are to be considered separate fleets.

- (12) "Component Swapping" means the movement of designated parts between different vehicles/applications utilizing the same DECS.
- (13) "Diesel emission control strategy" or "Diesel emission control system" means any device, system, or strategy employed with an in-use diesel vehicle or piece of equipment that is intended to reduce emissions. Examples of diesel emission control strategies include, but are not limited to, particulate filters, diesel oxidation catalysts, selective catalytic reduction systems, fuel additives used in combination with particulate filters, alternative diesel fuels, and combinations of the above.
- (14) "Diesel Emission Control Strategy Family Name." See Section 2706(j)(2).
- (15) "Diesel Engine" means an internal combustion engine with operating characteristics significantly similar to the theoretical diesel combustion cycle. The primary means of controlling power output in a diesel cycle engine is by limiting the amount of fuel that is injected into the combustion chambers of the engine. A diesel cycle engine may be petroleum-fueled (i.e., diesel-fueled) or alternate-fueled.
- (16) "Distributor" means any person or entity to whom a diesel emission control strategy is sold, leased or supplied for the purposes of resale or distribution in commerce.
- (17) "Donor Vehicle/engine" means any vehicle/engine whose installed DECS device has been removed for the purpose of re-designation or component swapping.
- (18) "Durability" means the ability of the applicant's diesel emission control strategy to maintain a level of emissions below the baseline and maintain its physical integrity over some period of time or distance determined by the Executive Officer pursuant to these regulations. The minimum durability testing periods contained herein are not necessarily meant to represent the entire useful life of the diesel emission control strategy in actual service.
- (19) "Emergency Standby Engine" means a diesel engine operated solely for emergency use, except as otherwise provided in airborne toxic control measures adopted by the ARB.
- (20) "Emergency Use" means using a diesel engine to provide electrical power or mechanical work during any of the following events and subject to the following conditions:
  - (A) The failure or loss of all or part of normal electrical power service or normal natural gas supply to the facility,
  - (B) The failure of a facility's internal power distribution system,
  - (C) The pumping of flood water or sewage to prevent or mitigate a flood or sewage overflow,
  - (D) The pumping of water for fire suppression or protection,

- (E) The powering of ALSF-1 and ALSF-2 airport runway lights under category II or III weather conditions,
  - (F) Other conditions as specified in airborne toxic control measures adopted by the ARB.
- (21) "Emission control group" means a set of diesel engines and applications determined by parameters that affect the performance of a particular diesel emission control strategy. The exact parameters depend on the nature of the diesel emission control strategy and may include, but are not limited to, certification levels of engine emissions, combustion cycle, displacement, aspiration, horsepower rating, duty cycle, exhaust temperature profile, and fuel composition. Verification of a diesel emission control strategy and the extension of existing verifications are done on the basis of emission control groups.
- (22) "End user" means any individual or entity that owns or operates a vehicle or piece of equipment that has a verified diesel emission control system installed.
- (23) "Executive Officer" means the Executive Officer of the Air Resources Board or the Executive Officer's designee.
- (24) "Executive Order" means the document signed by the Executive Officer that specifies the verification level of a diesel emission control strategy for an emission control group and includes any enforceable conditions and requirements necessary to support the designated verification.
- (25) "Fuel Additive" means any substance designed to be added to fuel or fuel systems or other engine-related systems such that it is present in-cylinder during combustion and has any of the following effects: decreased emissions, improved fuel economy, increased performance of the entire vehicle or one of its component parts, or any combination thereof; or assists diesel emission control strategies in decreasing emissions, or improving fuel economy or increasing performance of a vehicle or component part, or any combination thereof. Fuel additives used in conjunction with diesel fuel may be treated as an alternative diesel fuel. See Section 2701 (a)(3) .
- (26) "Hot Start" means the start of an engine within four hours after the engine is last turned off. The first hot start test run should be initiated 20 minutes after the cold start for Federal Test Procedure testing following Section 86.1327-90 of the Code of Federal Regulations, Title 40, Part 86.
- (27) "Installer" means any individual or entity that equips any vehicle, engine or equipment with a diesel emission control strategy.
- (28) "Portable Engine" means an engine designed and capable of being carried or moved from one location to another, except as defined in section 2701(a)(33). Engines used to propel mobile equipment or a motor vehicle of any kind are not portable. Indicators of portability include, but are not limited to, wheels, skids, carrying handles, dolly, trailer, or platform. A portable engine cannot remain at the same facility location for more than 12 consecutive rolling months or 365 rolling days, whichever occurs first, not including time spent in a storage facility. If it

does remain at the facility for more than 12 months, it is considered to be a stationary engine. The definitions in Title 13 California Code of Regulations section 2452(g) and section 2452(x) are incorporated by reference herein.

- (29) "Re-designation" means the movement of a used verified DECS from an appropriate engine/application and installation to another engine/application meeting the terms and conditions of the DECS Executive Order within the same common ownership fleet.
- (30) "Regeneration" in the context of diesel particulate filters, means the periodic or continuous combustion of collected particulate matter that is trapped in a particulate filter through an active or passive mechanism. Active regeneration requires a source of heat other than the exhaust itself to regenerate the particulate filter. Examples of active regeneration strategies include, but are not limited to, the use of fuel burners and electrical heaters. Passive regeneration does not require a source of heat for regeneration other than the exhaust stream itself. Examples of passive regeneration strategies include, but are not limited to, the use of fuel additives and the catalyst-coated particulate filter. In the context of NOx reduction strategies, "regeneration" means the desorption and reduction of NOx from NOx adsorbers (or NOx traps) during rich operation conditions.
- (31) "Revoke" means to cancel the verification status of a diesel emission control strategy. If a diesel emission control strategy's verification status is revoked by the Executive Officer, the applicant must immediately cease and desist selling the diesel emission control strategy to end-users.
- (32) "Seller" means any person or entity that sells, leases or supplies a diesel emission control strategy.
- (33) "Stationary Engine" means an engine that is designed to stay in one location, or remains in one location. An engine is stationary if any of the following are true:
  - (A) The engine or its replacement is attached to a foundation, or if not so attached, will reside at the same location for more than 12 consecutive months. Any engine that replaces engine(s) at a location, and is intended to perform the same or similar function as the engine(s) being replaced, will be included in calculating the consecutive time period. In that case, the cumulative time of all engine(s), including the time between the removal of the original engine(s) and installation of the replacement engine(s), will be counted toward the consecutive time period; or
  - (B) The engine remains or will reside at a location for less than 12 consecutive months if the engine is located at a seasonal source and operates during the full annual operating period of the seasonal source, where a seasonal source is a stationary source that remains in a single location on a permanent basis (at least two years) and that operates at that single location at least three months each year; or

- (C) The engine is moved from one location to another in an attempt to circumvent the residence time requirements [Note: The period during which the engine is maintained at a storage facility shall be excluded from the residency time determination.] The definitions in Title 13 California Code of Regulations Section 2452(g) and Section 2452(x) are incorporated by reference herein.
- (34) "Unidirectional Device Design and Installation" means that an emission control device must be appropriately designed, manufactured and labeled to prevent reverse flow installation.
- (35) "Used Verified Device" means any verified DECS which has been sold or leased to an end user and installed on an engine/application.
- (36) "Verification" means a determination by the Executive Officer that a diesel emission control strategy meets the requirements of this Procedure. This determination is based on both data submitted or otherwise known to the Executive Officer and engineering judgment.
- (37) "Warrantable Condition" means any condition of the diesel emission control strategy, vehicle, or engine which triggers the responsibility of the applicant to take corrective action pursuant to Section 2707.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, 43105, 43600 and 43700, Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code; and Title 17 California Code of Regulations Section 93000.

## **§ 2702. Application Process.**

- (a) Overview. Before submitting a final application for the verification of a diesel emission control strategy for use with an emission control group, the applicant must submit a preliminary verification application (pursuant to Section 2702(b)) at the Executive Officer's discretion in the format shown in 2702(d). To obtain verification, the applicant must conduct emission reduction testing (pursuant to Section 2703), durability testing (pursuant to Section 2704), a field demonstration (pursuant to Section 2705), and submit the results along with comments and other information (pursuant to Sections 2706 and 2707) in a final verification application to the Executive Officer, in the format shown in Section 2702(d). If the Executive Officer grants verification of a diesel emission control strategy, it will issue an Executive Order to the applicant identifying the verified emission reduction and any conditions that must be met for the diesel emission control strategy to function properly. After the Executive Officer grants verification of a diesel emission control strategy, the applicant must provide a warranty, conduct in-use compliance testing of the strategy after having sold or leased a specified number of units, and report the results to the Executive Officer (pursuant to Section 2709). A diesel emission control strategy that employs two or more individual systems or

components must be tested and submitted for evaluation as one system. A verified diesel emission control strategy may not be installed on an engine with another diesel emission control strategy that is not included in the Executive Order. Applicants seeking verification of an alternative diesel fuel must follow the procedure described in Section 2710.

(b) Preliminary Verification Application. Before formally submitting a final application for the verification of a diesel emission control strategy, the applicant must submit a preliminary verification application at the Executive Officer's discretion. The Executive Officer shall use the information in the preliminary verification application to help determine whether the strategy relies on sound principles of science and engineering to control emissions, the need for additional analyses, and the appropriateness of allowing alternatives to the prescribed requirements. The preliminary verification application must follow the format shown in Section 2702(d) and at a minimum provide the information required in sections 1. through 5., and section 8.A.5, where applicable. In addition, the preliminary verification application must include the following information:

- (1) Identification of the contact persons, phone numbers, names and addresses of the responsible party submitting the preliminary verification application.
- (2) Description of the diesel emission control strategy's principles of operation. A schematic depicting operation must be included. It is the responsibility of the applicant to demonstrate that its product relies on sound principles of science and engineering to achieve emission reductions.
  - (A) If, after reviewing the preliminary verification application, the Executive Officer determines that the applicant has not made a satisfactory demonstration that its product (diesel emission control strategy) relies on sound principles of science and engineering to achieve emission reductions, the Executive Officer shall notify the applicant of the determination in writing within 30 days of receiving the preliminary verification application. The applicant may choose to withdraw from the verification process or submit additional materials and clarifications. The additional submittal must be received by the Executive Officer no later than 60 days from the date of the notification letter or the application may be suspended.
  - (B) If, after reviewing the additional submittal, the Executive Officer determines that the applicant has not yet made a satisfactory demonstration that its product relies on sound principals of science and engineering to achieve emission reductions, the preliminary verification application shall be suspended. If a preliminary verification application has been suspended, it may only be reactivated at the discretion of the Executive Officer.
  - (C) If at any time, the Executive Officer has reason to doubt the scientific or engineering soundness of a product, the Executive Officer shall notify

the applicant in writing and may require the applicant to submit additional supporting materials and clarifications no later than 60 days from the date of the notification letter. If the additional submittal is not received by the Executive Officer by the deadline established in the notification letter, the preliminary or final application may be suspended or the existing verification may be revoked. In deciding whether to suspend a preliminary or final application or revoke an existing verification the Executive Officer will review submittals as provided in subsection (B) above.

- (3) Preliminary parameters for defining emission control groups that are appropriate for the diesel emission control strategy. The Executive Officer will work with the applicant to determine appropriate emission control group parameters.
  - (4) The applicant's proposed test plan for meeting the requirements of Sections 2702-2706. Existing test data may be submitted for the Executive Officer's consideration. The preliminary verification application must focus on verification of the diesel emission control strategy for use with a single emission control group.
  - (5) A brief statement that the applicant acknowledges and agrees to do the following:
    - (A) Provide a warranty pursuant to the requirements of Section 2707.
    - (B) Submit in-use compliance information pursuant to the requirements of Section 2709.
    - (C) Keep records until the in-use compliance requirements are completed that contain information per Section 2702 (m) including:
      - 1. Updated end user contact information.
      - 2. A description of the vehicles or equipment on which the applicant's products are installed.
      - 3. A description of the engines on which the applicant's products are installed.
- (c) When an applicant submits a preliminary verification application, the Executive Officer shall, within 30 days of its receipt, determine whether the applicant has identified the information necessary to support an application for verification and notify the applicant in writing that it may submit an application for verification. The Executive Officer may suggest modifications to the proposed preliminary verification application to facilitate verification of the diesel emission control strategy. All applications, correspondence, and reports must be submitted in writing to:



Chief, Heavy-Duty Diesel In-Use Strategies Branch  
Air Resources Board  
1001 I Street  
Sacramento, CA 95814

(d) Application Format. The preliminary and final verification applications must be submitted in writing to the address shown in subsection (c) above. Electronic mail and verbal submissions do not constitute acceptable application formats. Supporting data in electronic format may be accepted as part of the application at the discretion of the Executive Officer. The preliminary and final verification applications for a diesel emission control strategy must follow the format shown below. If a section asks for information that is not applicable to the diesel emission control strategy, the applicant must indicate "not applicable." If the Executive Officer concurs with the applicant's judgment that a section is not applicable, the Executive Officer may waive the requirement to provide the information requested in that section. Final verification applications must include all of the information provided in the preliminary verification application as described in Section 2702(b), including any additional information, updates, or changes, and all additional information shown below.

1. *Introduction*

- 1.1 Identification of applicant, manufacturer, and product
- 1.2 Identification of type of verification being sought
  - 1.2.1 Description of emission control group selected
  - 1.2.2 Emission reduction claim
  - 1.2.3 Description of intended applications (examples of in-use vehicles or equipment, typical duty cycles, fuel requirements, etc.)

2. *Diesel Emission Control Strategy Information*

- 2.1 General description of the diesel emission control strategy
  - 2.1.1 Detailed discussion of principles of operation and system design
  - 2.1.2 Description of inducement method if applicable
  - 2.1.3 Schematics depicting operation (as appropriate)
  - 2.1.4 A list identifying all the parts of the diesel emission control strategy as described in Section 2706(o)
  - 2.1.5 Detailed description of measures taken to prevent reverse flow installation
- 2.2 Description of regeneration method
  - 2.2.1 Operating condition requirements for regeneration
  - 2.2.2 Thresholds and control logic to activate regeneration
  - 2.2.3 Description of backpressure monitor including thresholds and control logic
- 2.3 Favorable operating conditions

- 2.4 Unfavorable operating conditions and associated reductions in performance
  - 2.5 Fuel and lubricating oil requirements and misfueling considerations
  - 2.6 Identification of failure modes and associated consequences
  - 2.7 Complete discussion of potential safety issues (*e.g., uncontrolled regeneration, lack of proper maintenance, unfavorable operating conditions, etc.*)
  - 2.8 Installation requirements
  - 2.9 Maintenance requirements
    - 2.9.1 Detailed description of all normal maintenance requirements for the diesel emission control system
    - 2.9.2 A copy of the language that will instruct the end user of proper handling of spent components and/or materials cleaned from the diesel emission control system, identify any hazardous materials, and provide procedures for resetting any backpressure monitors after maintenance procedures are completed.
  - 2.10 Description of noise level control compliance
3. *Alternative Diesel Fuel and Fuel Additive Information.*  
 (Use of an alternative diesel fuel/fuel additive requires a multimedia evaluation as required by Section 43830.8 California Health and Safety Code)
- 3.1 Additional information from Section 2710(b), 2710(c), 2710(f), and 2710(g)
  - 3.2 Emission control group compatibility considerations
  - 3.3 Misfueling prevention strategies
  - 3.4 Multimedia evaluation
    - 3.4.1 Additional test data and information required for multimedia evaluation
4. *Diesel Emission Control Strategy and Emission Control Group Compatibility*
- 4.1 Compatibility with the engine
    - 4.1.1 Discussion on calibrations and design features that may vary from engine to engine
    - 4.1.2 Effect on overall engine performance
    - 4.1.3 Effect on engine backpressure
    - 4.1.4 Additional load on the engine
    - 4.1.5 Effect on fuel consumption
    - 4.1.6 Engine oil consumption considerations
  - 4.2 Compatibility with the application
    - 4.2.1 Dependence of calibration and other design features on application characteristics
    - 4.2.2 Presentation of typical exhaust temperature profiles and other relevant field-collected data from representative applications within the emission control group
    - 4.2.3 Comparison of field-collected application data with operating conditions suitable for the diesel emission control strategy

5. *Testing Information*

5.1 Emission reduction testing

- 5.1.1 Test facility identification including capabilities and identification of all analytical instruments
- 5.1.2 Description of test vehicle and engine (*make, model year, engine family name, PM and NOx certification levels if applicable, etc.*)
- 5.1.3 Statement indicating whether the test engine is in a proper state of maintenance, and/or has been rebuilt or modified from the original engine manufacturer configuration
- 5.1.4 Description of test fuel
- 5.1.5 Discussion of effects of elevated NOx emissions on diesel emission control strategy (effects on emission reduction performance, durability, safety, and control strategy response)
- 5.1.6 Test procedure description (*-pre-conditioning period, test cycle, etc.*)
- 5.1.7 Test results and comments
- 5.1.8 Incomplete and aborted test data and explanations

5.2 Durability testing

- 5.2.1 Test facility identification including capabilities and identification of all analytical instruments
- 5.2.2 Description of field application (where applicable)
- 5.2.3 Description of test vehicle and engine (*make, model year, engine family name, PM and NOx certification levels if applicable, etc.*)
- 5.2.4 Analysis of emissions test fuel
- 5.2.5 Analysis of durability test fuel
- 5.2.6 Test procedure description (*field or bench, test cycle, etc.*)
- 5.2.7 Test Procedure demonstrating durability of monitoring and notification system
- 5.2.8 Description of maintenance during durability testing
- 5.2.9 Test results and comments
- 5.2.10 Summary of evaluative comments from third-party for in-field durability demonstration (*e.g., driver or fleet operator*)

5.3 Field demonstration (where applicable)

- 5.3.1 Field application identification
- 5.3.2 Description of test vehicle and engine (*make, model year, engine family name, PM and NOx certification levels if applicable, etc.*)
- 5.3.3 Engine backpressure and exhaust temperature graphs with comments
- 5.3.4 Summary of evaluative comments from third-party (*e.g., driver or fleet operator*)
- 5.3.5 Description of test failures

6. *Warranty and In-Use Compliance Requirements*

- 6.1 Statement that the applicant agrees to provide annual warranty reports and to follow the warranty requirements per Section 2707

6.2 Statement that the applicant agrees to follow the in-use compliance requirements per Section 2709

6.3 Statement that the applicant agrees to keep the required end user information per Section 2702(m)

7. *References*

8. *Appendices*

- A. Laboratory test report information (*for all tests, including incomplete, aborted and failed tests*)
  - A.1 Actual laboratory test data
  - A.2 Plots of engine backpressure and exhaust temperature
  - A.3 Driving traces for chassis dynamometer tests
  - A.4 Quality assurance and quality control information
  - A.5 Testing equipment information and indication that testing equipment meets specifications and calibrations given in the Code of Federal Regulations, Title 40, Part 86 (See Sections 2703(m), 2706(a)(2))
- B. Third-party letters or questionnaires describing in-field performance
- C. Diesel emission control system label
- D. Copy of the Owner's manual (as described in Section 2706 (l))
- E. Copy of the Installation Manual
- F. Sample diesel emission control system label (See Section 2706(j))
- G. Other supporting documentation

(e) Within 30 days of receipt of the preliminary application, the Executive Officer shall notify the applicant whether the application is complete.

(f) Within 60 days after a final application has been deemed complete, the Executive Officer shall determine whether the diesel emission control strategy merits verification and shall classify it as shown in Table 1:

Table 1. Verification Classifications for Diesel Emission Control Strategies

| Pollutant | Reduction                    | Classification            |
|-----------|------------------------------|---------------------------|
| PM        | < 25%                        | Not verified              |
|           |                              | Level 0* (see note below) |
|           | ≥ 25%                        | Level 1                   |
|           |                              | Level 1 Plus**            |
|           | ≥ 50%                        | Level 2                   |
|           |                              | Level 2 Plus**            |
|           | ≥ 85%,<br>or ≤ 0.01 g/bhp-hr | Level 3                   |
|           |                              | Level 3 Plus**            |
| NOx       | < 25%                        | Not verified              |
|           | ≥ 25%                        | Mark 1                    |
|           | ≥ 40%                        | Mark 2                    |
|           | ≥ 55%                        | Mark 3                    |
|           | ≥ 70%                        | Mark 4                    |
|           | ≥ 85%                        | Mark 5                    |

\*A diesel emission control strategy that reduces emissions of PM by less than 25 percent may be verified as a Level 0 strategy if it reduces emissions of NOx by at least 25 percent and meets the other criteria in section 2700.

\*\*The diesel emission control strategy complies with the 20 percent NO<sub>2</sub> limit before January 1, 2009 (and after January 1, 2007).

The applicant and the Executive Officer may mutually agree to a longer time period for reaching a decision, and additional supporting documentation may be submitted by the applicant before a decision has been reached. The Executive Officer shall notify the applicant of the decision in writing and specify the verification level for the diesel emission control strategy and identify any terms and conditions that are necessary to support the verification.

- (g) Extensions of an Existing Verification. If the applicant has verified a diesel emission control strategy with one emission control group and wishes to extend the verification to include additional emission control groups, it may apply to do so using the original test data, additional test data, engineering justification and analysis, or any other information deemed necessary by the Executive Officer to address the differences between the emission control

group already verified and the additional emission control group(s).  
Processing time periods follow sections (e) and (f) above.

- (h) Conditional Extensions of an Existing Verification for On-road Applications. If an applicant has an ARB verified diesel emission control strategy and wishes to extend the verification to include new on-road emission control groups, the applicant may apply to receive a conditional extension. If the Executive Officer determines that the diesel emission control strategy is technologically sound and appropriate for the intended application, the applicant may be granted a conditional extension for up to one year. Upon receiving a conditional extension, the applicant may sell the diesel emission control strategy as a verified product for the duration of the conditional extension period. To obtain full verification, the applicant must complete the requirements set forth by the Executive Officer according to the requirements of the regulation. In granting a conditional extension, the Executive Officer may consider all relevant information including, but not limited to, the following: the design of the diesel emission control strategy, original test data, other relevant test data, the duty cycle of the prospective emission control group, and field experience. For the time period it is effective, a conditional extension is equivalent to a verification for the purposes of satisfying the in-use compliance requirements. Emission control strategies that are conditionally verified for off-road and stationary applications are not eligible for conditional extensions (See Section 2704(l)).
- (i) Design Modifications. If an applicant modifies the design of a diesel emission control strategy that has already been verified or is under consideration for verification by the Executive Officer, the modified version must be evaluated under this Procedure. The applicant must provide a detailed description of the design modification along with an explanation of how the modification will change the operation and performance of the diesel emission control strategy. To support its claims, the applicant must submit additional test data, engineering justification and analysis, or any other information deemed necessary by the Executive Officer to address the differences between the modified and original designs. Processing time periods follow sections (e) and (f) above.
- (j) Verification Transfers. If an applicant wishes to sell, lease, or supply another manufacturer's previously verified diesel emission control system, the applicant must do the following:
- (1) Submit a letter of consent from the manufacturer that legally holds the original verification. The letter must give the applicant the right to hold a verification for the diesel emission control system and, if applicable, to use information that was previously submitted as support in the application for the original verification.
  - (2) Submit an application(s) per Section 2702 of this Procedure. If previously submitted information is included, necessary additional information must

- be submitted that satisfies all applicable requirements of this Procedure (e.g. testing data, warranty statement, label, owner's manual, etc.).
- (3) Submit a description of the diesel emission control strategy's principles of operation. The applicant must demonstrate understanding of how the product relies on sound principles of science and engineering to achieve emissions reductions.
- (k) Emission Control Systems Approved under Other Verification Programs. Any applicant with a diesel emission control system that is verified under another diesel emission control verification program that wishes to receive ARB verification must submit an application that contains the information requested in part (d) above. Pre-existing data and information submitted in support of verification approval from other programs may be submitted, but the applicant must meet requirements that are unique to this Procedure including, but not limited to, a system label compliant with Section 2706(j), a California owner's manual compliant with Section 2706(l), a warranty compliant with Section 2707, in-use compliance requirements per Section 2709, and multimedia evaluation if applicable. The Executive Officer may evaluate all information submitted including additional information required by this Procedure to determine if a diesel emission control strategy merits ARB verification.
- (l) Treatment of Confidential Information. Information submitted to the Executive Officer by an applicant may be claimed as confidential, and such information shall be handled in accordance with the procedures specified in Title 17, California Code of Regulations, Sections 91000-91022. The Executive Officer may consider such confidential information in reaching a decision on a verification application.
- (m) Applicants that receive verifications, conditional verifications (See Section 2704(l), or conditional extensions must keep records that have valid end user contact information (name, address, phone number), a description of the vehicles or equipment the units are applied to (type of vehicle/equipment, make, model year, vehicle identification number), and a description of the engines the units are applied to (make, model, model year, engine serial number, engine family name). The applicant must keep these records for each diesel emission control strategy family until the in-use compliance requirements of the diesel emission control strategy family are completed. Applicants that receive conditional extensions or conditional verifications must submit these records to the Executive Officer one year after receiving the conditional extension or conditional verification. Applicants that receive verifications must submit these records upon request by the Executive Officer to an agent or employee of ARB. The Executive Officer may request that such records be made available at any time. The applicant must provide these records within 30 days of the request by the ARB. Failure to submit these records may result in revocation or suspension of the verification

and/or any other remedy available under Part 5, Division 26 of the Health and Safety Code.

- (n) The Executive Officer may at any time with respect to any diesel emission control strategy sold, leased, offered for sale, intended for sale, or manufactured for sale in California, order the applicant or manufacturer to submit records pertaining to the diesel emission control strategy, at the applicant's expense, to a location specified by the Executive Officer.
- (o) Applicants that receive verifications, conditional verifications, or conditional extensions must demonstrate sales or the active pursuit of sales of their diesel emission control systems in California upon request of the Executive Officer. If an applicant fails to provide such proof, the Executive Officer will evaluate whether the verification should be revoked.
- (p) The Executive Officer may, with respect to any diesel emission control strategy sold, leased, offered for sale, intended for sale, or manufactured for sale in California, order the applicant or strategy manufacturer to make available for testing and/or inspection a reasonable number of diesel emission control systems, and may direct that they be delivered at the applicant's expense to the state board at the Haagen-Smit Laboratory, 9528 Telstar Avenue, El Monte, California or where specified by the Executive Officer. The Executive Officer may also, with respect to any diesel emission control strategy being sold, leased, offered for sale, intended for sale, or manufactured for sale in California, have an applicant test and/or inspect under the supervision of the Executive Officer a reasonable number of units at the applicant's or manufacturer's facility or at any test laboratory accepted by the Executive Officer. All such testing and inspection is confirmatory in nature. If the Executive Officer finds performance that is not consistent with either an existing or requested verification, the applicant must address and resolve the inconsistency to the satisfaction of the Executive Officer in order to maintain or receive verification. Any testing and inspection done by ARB cannot be used as a substitute for emissions test data or other support required in an application for verification.
- (q) The Executive Officer may lower the verification level or revoke the verification status of a verified diesel emission control strategy family, a conditionally verified system, or a system with a conditional extension or suspend all review of pending verification applications if the Executive Officer determines that there are errors, omissions, inaccurate information, fraudulent submittals, or a deficiency of required submittals in the application for verification, supporting information, warranty report, or in-use compliance testing. Additionally, penalties may be assessed under Part 5, Division 26 of the Health and Safety Code. The Executive Officer may suspend the review of all other applications sent by an applicant if that applicant fails to submit warranty reports or other requested information. The Executive Officer may



also seek remedial action against the applicant if it is determined that the verified diesel emission control strategy does not comply with the requirements or provisions of the Executive Order.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, 43105, 43600 and 43700, Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code; and Title 17 California Code of Regulations Section 93000.

### **§ 2703. Emission Testing Requirements.**

- (a) The applicant must test the diesel emission control strategy on an emission control group basis and identify the emission control group. The applicant must identify the test engines and vehicles, if applicable, by providing the engine family name, make, model, model year, and PM and NO<sub>x</sub> certification levels if applicable. The applicant must also describe the applications for which the diesel emission control strategy is intended to be used by giving examples of in-use vehicles or equipment, characterizing typical duty cycles, indicating any fuel requirements, and/or providing other application-related information.
- (b) Test Engine Requirements and Pre-conditioning. The applicant may tune-up or rebuild test engines prior to, but not after, baseline testing unless rebuilding the engine is an integral part of the diesel emission control strategy. All testing should be performed with the test engine in a proper state of maintenance. Emissions of NO<sub>2</sub> from the test engine must not exceed 15 percent of the total baseline NO<sub>x</sub> emissions by mass. If there is a special category of engines with NO<sub>2</sub> emission levels that normally exceed 15 percent, this requirement may be adjusted for those engines at the discretion of the Executive Officer.
- (c) Diesel Emission Control System Pre-conditioning. The engine or vehicle installed with a diesel emission control system must be operated for a break-in period of between 25 and 125 hours before emission testing. Note that special pre-conditioning requirements may apply. See section 2706(a)(4) for details.
- (d) Test Fuel.
  - (1) The test fuel must meet the specifications in the California Code of Regulations (Sections 2280 through 2283 of Title 13), with the exception of the sulfur content or other properties previously identified by the applicant and approved by the Executive Officer. The Executive Officer may approve test fuel(s) that do not comply with Sections 2280 through

2283 of Title 13 of the California Code of Regulations if the fuel(s) are determined to be, based on sound science and engineering, representative of commercially available fuel typically used for the intended application(s).

- (2) If operation or performance of a diesel emission control strategy is affected by fuel sulfur content, the sulfur content of the test fuel must be no less than 66 percent of the stated maximum sulfur content for the diesel emission control strategy, unless
    - (A) the testing is performed with fuel containing 15 ppmw or less sulfur for verification on 15 ppmw or less sulfur diesel fuel, or
    - (B) the testing is performed with diesel fuel commercially available in California for verification on CARB diesel fuel (i.e., fuel meeting the specifications in Title 13, California Code of Regulations, Sections 2280 through 2283).
  - (3) Baseline testing may be conducted with commercially available diesel fuel or diesel fuel with 15 ppmw or less sulfur. Baseline and control tests must be performed using the same fuel unless the control fuel is specified as a component of the emission control strategy.
  - (4) The test fuel (or batch of fuel purchased) must be analyzed using American Society for Testing and Materials (ASTM) test methods listed in Table 6 (See Section 2710), which are incorporated herein by reference. At a minimum, sulfur content, aromatic content, polycyclic aromatic hydrocarbons, nitrogen content, and cetane number must be reported. The Executive Officer may ask for additional properties to be reported if evidence suggests those properties may affect functioning of the diesel emission control strategy.
- (e) Test Cycle. The diesel emission control strategy must be tested using the test cycles indicated in subparagraphs 1-3 below (summarized in Table 2) or with an alternative cycle(s) approved by the Executive Officer pursuant to subsection (f) below. The Executive Officer may require the applicant to conduct additional testing if such information is necessary for a complete evaluation of the control technology.

Table 2. Test Cycles for Emission Reduction Testing\*

| Test Type | On-Road   | Off-Road (including portable engines)  | Stationary  |
|-----------|---|--|---|
| Engine    | FTP Heavy-duty Transient Cycle (1 cold-start and 3 hot-starts)                      | Steady-state test cycle from ARB off-road regulations until December 31, 2008 with Executive Officer approval, otherwise; Transient test cycle from ARB off-road regulations (3 hot-starts either cycle) | Discrete mode test cycle from ARB off-road regulations (3 hot-starts) |
| Chassis   | UDDS (3 hot-starts) and a low-speed test cycle per 2703 (e)(1)(B)2. (3 hot-starts). | Not Applicable   | Not Applicable  |

FTP = Federal Test Procedure; UDDS = Urban Dynamometer Driving Schedule

- (1) On-road Engines and Vehicles. For on-road diesel-fueled vehicles, the applicant may choose between engine dynamometer testing and chassis dynamometer testing, subject to the following conditions. Engine testing may be used for verification of an absolute engine emissions level or a percent emission reduction. Chassis testing may be used only to verify a percent emission reduction. The applicant may use emission test data to satisfy the durability test data requirement, but must follow the same testing option for the remaining durability tests (see Section 2704).
- (A) Engine testing must consist of one cold-start and at least three hot-start tests using the Federal Test Procedure (FTP) Heavy-duty Transient Cycle for engines used in on-road applications, in accordance with the provisions in the Code of Federal Regulations, Title 40, Part 86, Subpart N.
- (B) The applicant must conduct all chassis tests in accordance with the provisions of the Code of Federal Regulations, Title 40, Part 86, Subpart N insofar as they pertain to chassis dynamometer testing. Chassis testing must include two separate test cycles as follows:
1. At least three hot-start tests using the Urban Dynamometer Driving Schedule (UDDS) (see Code of Federal Regulations, Title 40, Part 86, appendix I (d)).
  2. Three hot-start tests using a low-speed chassis test cycle representing urban stop-and-go traffic operation. The test cycle must include a repetitive series of idling periods immediately

followed by events of maximum vehicle acceleration. The applicant can propose, for Executive Officer approval, a low-speed cycle as applicable to the type of vehicle and vehicle operation for which the diesel emission control strategy is intended. The Executive Officer will provide examples (e.g., New York Bus Cycle) of appropriate test cycles upon request by the applicant during the verification process. The applicant may request that the Executive Officer waive the requirement to conduct the low-speed chassis test. In reviewing this request, the Executive Officer may consider all relevant information including, but not limited to, characteristics of the duty cycles in the emission control group and the principles of operation of the diesel emission control strategy.

3. The driver must follow the test cycles as closely as possible and must not deviate beyond the following tolerances (See Code of Federal Regulation, Part 86, Subpart M, 86.1215-85).
  - a. The upper limit is 4 miles per hour higher than the highest point on the trace within 1 second of the given time.
  - b. The lower limit is 4 miles per hour lower than the lowest point on the trace within 1 second of the given time.
  - c. Speed variations greater than the tolerances (such as may occur during gear changes or braking spikes) are acceptable, provided they occur for less than 2 seconds on any occasion and are clearly documented as to the time and speed at that point of the test cycle.
  - d. Speeds lower than those prescribed are acceptable, provided the vehicle is operated at maximum available power during such occurrences.
- (C) For any diesel emission control strategy intended to reduce NO<sub>x</sub> from on-road applications, the applicant must identify and discuss the effects of elevated NO<sub>x</sub> emissions on the diesel emission control strategy (emissions of NO<sub>x</sub> that are significantly greater than certified levels are said to be elevated, and may result, for example, from the activation of an AECD that advances fuel injection timing under cruise conditions). The applicant's discussion must include effects on emission reduction performance, durability, and safety considerations, how the strategy would respond to elevated NO<sub>x</sub> emissions that do not occur at the time the strategy is calibrated, and must be supported by engineering justification and any pertinent data.
- (2) Off-road Engines and Equipment (including portable engines). For off-road diesel-fueled vehicles and equipment, the applicant must follow the transient test procedures outlined in the ARB off-road regulations (California Code of Regulations, Title 13, Section 2423 and the incorporated California Exhaust Emissions Standards and Test Procedures for New 2008 and Later Tier 4 Off-Road Compression-Ignition Engines, Part I-C). For all variable speed engines, a minimum of three

hot-start tests must be conducted using the Nonroad Transient Composite Cycle (NRTC).

- (A) The Executive Officer may require the applicant to follow another test cycle if the Executive Officer determines that it is more representative of the in-use duty cycle of the off-road application for which the applicant seeks verification.
  - (B) An applicant may follow the steady state test procedure outlined in the ARB off-road regulations (California Code of Regulations, Title 13, Section 2423 and the incorporated California Exhaust Emission Standards and Test Procedures for New 2000 and Later Tier 1, Tier 2, and Tier 3 Off-Road Compression-Ignition Engines, Part I-B) only if the applicant has submitted a complete preliminary verification application by October 1, 2008 and has received a letter of notification from the Executive Officer, dated no later than December 31, 2008 that the application is complete. In addition, the applicant must submit a complete final verification application that is consistent with the terms of the approved preliminary verification application by July 1, 2010. If the applicant fails to submit a complete final verification application by July 1, 2010, the applicant must test using the NRTC.
  - (C) An applicant with a system verified after October 19, 2007 using the steady state test procedure outlined in the ARB off-road regulations (California Code of Regulations, Title 13, Section 2423 and the incorporated California Exhaust Emission Standards and Test Procedures for New 2000 and Later Tier 1, Tier 2, And Tier 3 Off-Road Compression-Ignition Engines, Part I-B) must submit emissions test data using the NRTC by January 1, 2013. The Executive Officer will reassess and potentially revise the verification status of the system, claimed emissions reductions, and compliance with NO<sub>2</sub> emissions requirements based on the submitted data. Appropriate testing must include a pre-conditioned unit, an aged unit, and a baseline test. If such data are not received and approved by the Executive Officer by January 1, 2013, the verification will be revoked. A verification awarded prior to October 19, 2007, is not subject to this requirement. A verification for which the Executive Officer determines the NRTC is not appropriate per section 2703(e)(2)(A) is not subject to this requirement.
  - (D) Applicants may request that the Executive Officer consider alternative test cycles, as described in subsection (f).
- (3) Stationary Engines. For stationary engines, the applicant must follow the discrete mode test procedures outlined in the ARB off-road regulations (as referenced in (2) above). A minimum of three hot-start tests must be conducted using the specified test cycle. Applicants may request that the Executive Officer consider alternative test cycles and methods, as described in subsection (f).

- (f) Alternative Test Cycles and Methods. The applicant may request the Executive Officer to approve an alternative test cycle or method in place of a required test cycle or method. In reviewing this request, the Executive Officer will consider all relevant information including, but not limited to, the following:
- (1) Test procedures specified in airborne toxic control measures adopted by the ARB, e.g. the Airborne Toxic Control Measure for Stationary Compression Ignition Engines,
  - (2) Similarity of average speed, percent of time at idle, average acceleration, and other characteristics to the specified test cycle or method and in-use duty cycle,
  - (3) Body of existing test data generated using the alternative test cycle or method,
  - (4) Technological necessity, and
  - (5) Technical ability to conduct the required test.
- (g) Test Run. The number of tests indicated in Table 2 must be run for both baseline (without the diesel emission control strategy implemented) and control configurations. For strategies that include exhaust aftertreatment, engine backpressure and exhaust temperature must be measured and recorded on a second-by-second basis (1 Hertz) during at least one baseline run and each of the control test runs. For strategies that use a chemical reductant to reduce emissions of NO<sub>x</sub> from on-road or off-road applications, the amount of reductant consumed during each control test run must be measured and recorded.
- (h) Emissions During Particulate Filter Regeneration Events. For any diesel emission control strategy that has a distinct regeneration event, emissions that occur during the event must be measured and taken into account when determining the net emission reduction efficiency of the system. If a regeneration event will not occur during emission testing, applicants may pre-load the diesel emission control system with diesel PM to force such an event to occur during testing, subject to the approval of the Executive Officer. Applicants must provide data or engineering analysis indicating when events occur on test cycles and in actual operation (e.g., backpressure data).
- (i) Results. For all valid emission tests used to support emission reduction claims, the applicant must report emissions of total PM, non-methane hydrocarbons or total hydrocarbons (whichever is used for the relevant engine or vehicle certification), oxides of nitrogen, nitrogen dioxide, carbon monoxide, and carbon dioxide.
- (1) For mobile sources, or for engines tested using an engine dynamometer, emissions must be reported in grams/mile (g/mile) or grams/brake horsepower-hour (g/bhp-hr).
  - (2) For stationary engines, gaseous and particulate matter emissions must be reported as required by the test methods approved by the Executive Officer.

- (j) Incomplete and Aborted Tests. The applicant must identify all incomplete and aborted tests and explain why those tests were incomplete or aborted.
- (k) Additional Analyses. The Executive Officer may require the applicant to perform additional analyses if there is reason to believe that the use of a diesel emission control strategy may result in the increase of toxic air contaminants, other harmful compounds, or a change in the nature or amount of the emitted particulate matter.
  - (1) In its determination, the Executive Officer may consider all relevant data, including but not limited to the following:
    - (A) The addition of any substance to the fuel, intake air, or exhaust stream,
    - (B) Whether a catalytic reaction is known or reasonably suspected to increase toxic air contaminants or ozone precursors,
    - (C) Results from scientific literature,
    - (D) Field experience, and
    - (E) Any additional data.
  - (2) These additional analyses may include, but are not limited to, measurement of the following:
    - (A) Benzene
    - (B) 1,3-butadiene
    - (C) Formaldehyde
    - (D) Acetaldehyde
    - (E) Polycyclic aromatic hydrocarbons (PAH)
    - (F) Nitro-PAH
    - (G) Dioxins
    - (H) Furans
  - (3) The Executive Officer will determine appropriate test methods for additional analyses in consultation with the applicant.
- (l) Quality Control of Test Data. The applicant must provide information on the test facility, test procedure, and equipment used in the emission testing. For data gathered using on-road and off-road test cycles and methods, applicants must provide evidence establishing that the test equipment used meets the specifications and calibrations given in the Code of Federal Regulations, Title 40, Part 86, subpart N. The testing information must be approved by the Executive Officer.
- (m) The Executive Officer may, with respect to any diesel emission control strategy sold, leased, offered for sale, or manufactured for sale in California, order the applicant or strategy manufacturer to make available for testing and/or inspection a reasonable number of diesel emission control systems, and may direct that they be delivered at the applicant's expense to the state board at the Haagen-Smit Laboratory, 9528 Telstar Avenue, El Monte, California or where specified by the Executive Officer. The Executive Officer

may also, with respect to any diesel emission control strategy being sold, leased, offered for sale, or manufactured for sale in California, have an applicant test and/or inspect a reasonable number of units at the applicant or manufacturer's facility or at any test laboratory under the supervision of the Executive Officer.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, 43105, 43600 and 43700, Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5 Health and Safety Code; Title 17 California Code of Regulations Section 93000.

#### **§ 2704. Durability Testing Requirements**

- (a) The applicant must demonstrate, to the satisfaction of the Executive Officer, the durability of the applicant's diesel emission control strategy through an actual field or laboratory-based demonstration combined with chassis or engine dynamometer-based emission tests. If the applicant chooses a laboratory-based durability demonstration, an additional field demonstration will be required to demonstrate in-field compatibility (pursuant to Section 2705). If the applicant has demonstrated the durability of the identical system in a prior verification or has demonstrated durability through field experience, the applicant may request that the Executive Officer accept the previous demonstration in fulfillment of this requirement. In evaluating such a request, the Executive Officer may consider all relevant information including, but not limited to, the similarity of baseline emissions and application duty cycles, the relationship between the emission control group used in previous testing and the current emission control group, the number of engines tested, evidence of successful operation and user acceptance, and published reports.
- (b) Engine Selection. Subject to the approval of the Executive Officer, the applicant may choose the engine and application to be used in the durability demonstration. The engine and application must be representative of the emission control group for which verification is sought. The selected engine need not be the same as the engine used for emission testing, but if the applicant does use the same engine, the emission testing may also be used for the initial durability tests. Emissions of NO<sub>2</sub> from the emissions test engine must not exceed 15 percent of the total baseline NO<sub>x</sub> emissions by mass. If there is a special category of engines with NO<sub>2</sub> emission levels that normally exceed 15 percent, this requirement may be adjusted for those engines at the discretion of the Executive Officer.
- (c) Test Fuel.
  - (1) The test fuel must meet the specifications in the California Code of Regulations (Sections 2280 through 2283 of Title 13), with the exception of the sulfur content or other properties previously identified by the



applicant and approved by the Executive Officer. The Executive Officer may approve test fuel(s) that do not comply with Sections 2280 through 2283 of Title 13 of the California Code of Regulations if the fuel(s) are determined to be, based on sound science and engineering, representative of commercially available fuel typically used for the intended application(s).

- (2) If operation or performance of a diesel emission control strategy is affected by fuel sulfur content, the sulfur content of the test fuel must be no less than 66 percent of the stated maximum sulfur content for the diesel emission control strategy, unless
  - (A) the testing is performed with fuel containing 15 ppmw or less sulfur for verification on 15 ppmw or less sulfur diesel fuel, or
  - (B) the testing is performed with diesel fuel commercially available in California for verification on CARB diesel fuel (i.e., fuel meeting the specifications in Title 13, California Code of Regulations, Sections 2280 through 2283).
- (3) Baseline testing may be conducted with commercially available diesel fuel or diesel fuel with 15 ppmw or less sulfur. Baseline and control tests must be performed using the same fuel unless the control fuel is specified as a component of the emission control strategy.
- (4) The test fuel (or batch of fuel purchased) must be analyzed using American Society for Testing and Materials (ASTM) test methods listed in Table 6 (See Section 2710), which are incorporated herein by reference. At a minimum, sulfur content, aromatic content, polycyclic aromatic hydrocarbons, nitrogen content, and cetane number must be reported. The Executive Officer may ask for additional properties to be reported if evidence suggests those properties may affect functioning of the diesel emission control strategy.

- (d) Service Accumulation. The durability demonstration consists of an extended service accumulation period in which the diesel emission control strategy is implemented in the field or in a laboratory accepted by the Executive Officer, with emission reduction testing before and after the service accumulation. Service accumulation begins after the first emission test and concludes before the final emission test. The pre-conditioning period required in Section 2703 (c) cannot be used to meet the service accumulation requirements.
  - (1) Minimum Durability Demonstration Periods. The minimum durability demonstration periods are shown in Table 3, below.

Table 3. Minimum Durability Demonstration Periods

| Engine Type  | Minimum Durability Demonstration Period |
|--|---|
| On-Road  | 50,000 miles or 1000 hours              |
| Off-Road (including portable engines) and Stationary | 1000 hours                              |
| Stationary Emergency Standby Engines                 | 500 hours                               |

- (2) Temperature and Backpressure Measurement Requirements. For strategies that include exhaust aftertreatment, engine backpressure and exhaust temperature must be measured and recorded for 1000 hours or over the entire durability period (whichever is shorter). The applicant must propose a measurement and recording protocol for approval by the Executive Officer. The protocol may include, but is not limited to, measurement and recording of values once every few seconds, or higher frequency measurement with recording of averages, minima, and maxima over longer time intervals. Data must be submitted electronically in columns as a text file or another format approved by the Executive Officer.
- (3) NO<sub>x</sub> Emissions Measurement Requirements. For strategies that include exhaust aftertreatment to reduce emissions of NO<sub>x</sub>, the mass emissions of NO<sub>x</sub> both upstream and downstream of the aftertreatment device must be measured and recorded for at least the first and last 100 hours of the durability period. The applicant must propose a measurement method for approval by the Executive Officer. The method may include, but is not limited to, the use of NO<sub>x</sub> sensors before and after the device. Measurements of NO<sub>x</sub> emissions must occur on at least a 1 Hertz basis. Data must be recorded as averages over time intervals no greater than 10 seconds. Data must be submitted electronically in columns as a text file or another format approved by the Executive Officer.
- (4) Fuel for Durability Demonstrations. The fuel used during durability demonstrations should be equivalent to the test fuel, or a fuel with properties less favorable to the durability of the emission control strategy. Durability demonstrations may, at the applicant's option and with the Executive Officer's approval, include intentional misfueling events so that data on the effects of misfueling may be obtained.
- (e) Third-Party Statement for In-field Durability Demonstrations. For in-field durability demonstrations, the applicant must provide a written statement from

- an Executive Officer approved third party, such as the owner or operator of the vehicle or equipment used, at the end of the durability period. The statement must describe overall performance, maintenance required, problems encountered, and any other relevant comments. The results of a visual inspection conducted by the third party at the end of the demonstration period must also be described. The description should comment on whether the diesel emission control strategy is physically intact, securely mounted, leaking any fluids, and should include any other evaluative observations.
- (f) Test Cycle. Testing requirements are summarized in Table 4. Note that the same cycle(s) must be used for both the initial and final tests.
- (1) On-Road Applications. The applicant must perform either chassis or engine dynamometer-based testing before beginning and after completion of the service accumulation as specified in Table 4. A minimum of three hot-start tests are required for chassis testing while a minimum of one cold-start and three hot-start tests are required for engine testing. Chassis testing requires an additional three hot-starts on a low-speed cycle as described in Section 2703(e)(1)(B)2. As indicated in Section 2703(e)(1)(B)2., the applicant may request the Executive Officer to waive the tests on a low-speed cycle. If a field durability demonstration is selected, the applicant must perform chassis dynamometer testing, or request that the Executive Officer consider engine dynamometer testing. In reviewing the request, the Executive Officer may consider all relevant information, including, but not limited to the following:
- (A) Similarity of the field vehicle's engine to the laboratory engine, and
  - (B) Similarity of the diesel emission control system's calibration and set-up when installed on the field vehicle to that when installed on the laboratory engine.
- (2) Off-road and Stationary Applications. The applicant must use the same cycle for the emission reduction testing as defined in Section 2703. A minimum of three hot-start tests is required.
- (g) Test Run. The requirements for emissions reduction testing are summarized in Table 4, below. Note that special pre-conditioning requirements may apply. See section 2706(a)(4) for details.
- (1) The diesel emission control strategy must undergo one set of emission tests before beginning and after completion of the service accumulation. Baseline testing with test repetitions as indicated in Table 4 must be conducted before and after the service accumulation. If baseline testing after the service accumulation is not technically feasible, the applicant may request the Executive Officer to waive the requirement. If there are substantial test data from previous field studies or field demonstrations, applicants may request that the Executive Officer consider these in place of the initial emission tests.
- (2) As an alternative to testing a single unit before and after the service accumulation period, the applicant may request that the Executive Officer

consider the testing of two identical units, one that has been pre-conditioned and another that has completed the service accumulation period. In reviewing the request, the Executive Officer may consider all relevant information, including, but not limited to, the following:

- (A) The effect of the diesel emission control strategy on engine operation over time. Strategies that cause changes in engine operation are likely not to qualify for this testing option.
  - (B) The quality of the evidence the applicant can provide to support that the two units are identical,
  - (C) Previous experience with similar or related technologies, and
  - (D) Whether the applicant is participating in the U.S. EPA verification process and has made an agreement with U.S. EPA to test two units.
- (3) For strategies that include exhaust aftertreatment, engine backpressure and exhaust temperature must be measured and recorded on a second-by-second basis (1 Hertz) during at least one baseline run and each of the control test runs.
- (4) For strategies that use a chemical reductant to reduce emissions of NO<sub>x</sub> from on-road or off-road applications, the amount of reductant consumed during each control test run must be measured and recorded.

Table 4. Emission Tests Required for Durability Demonstrations

| Application                   | Test Type | Initial Test (prior to service accumulation)<br>Final Test (after completion of 100% of the service accumulation) |
|-------------------------------|-----------|---|
| On-Road                       | Engine    | FTP Heavy-duty Transient Cycle<br>(1 cold and 3 hot-starts)   |
|                               | Chassis   | UDDS (3 hot-starts) and<br>a low-speed cycle per 2703 (e)(1)(B)2.(3 hot-starts)                                   |
| Off-Road and portable engines | Engine    | Steady-state test cycle from ARB off-road regulations or an alternative cycle<br>(3 hot-starts)                   |
| Stationary                    | Engine    | Steady-state test cycle from ARB off-road regulations or an alternative cycle<br>(3 hot-starts)                   |

(h) Maintenance During Durability Demonstration. Except for emergency engine repair, only scheduled maintenance on the engine and diesel emission control

system and re-fill of additives (if any) may be performed during the durability demonstration. If normal maintenance includes replacement of any component of the diesel emission control system, the time (miles, years, or hours) between component change or refill must be reported with the results of the demonstration.

- (j) Functional Testing of Monitoring and Notification Systems. The applicant must demonstrate the durability of all monitoring and notification systems employed by the diesel emission control strategy. Such systems include, but are not limited to, backpressure monitors, reductant level monitors, malfunction indicator systems, and mechanisms to de-rate an engine's maximum power output. The applicant must propose test procedures to demonstrate the durability of the monitoring and notification systems on a diesel emission control strategy that has completed the service accumulation period.
- (k) Performance Requirements. The diesel emission control strategy must meet the following requirements throughout the durability demonstration period:
  - (1) If the applicant claims a percent emission reduction, the percent emission reduction must meet or exceed the initial verified percent emission reduction level.
  - (2) If the applicant claims to achieve 0.01 g/bhp-hr for PM, the PM emission level must not exceed 0.01 g/bhp-hr.
  - (3) The diesel emission control system must maintain its physical integrity. Its physical structure and all of its components not specified for regular replacement during the durability demonstration period must remain intact and fully functional.
  - (4) The diesel emission control strategy must not cause any damage to the engine, vehicle, or equipment.
  - (5) The backpressure caused by the diesel emission control strategy should not exceed the engine manufacturer's specified limits, or must not result in any damage to the engine.
  - (6) No maintenance of the diesel emission control system beyond that specified in its owner's manual will be allowed without prior Executive Officer approval.
- (l) Conditional Verification for Off-road and Stationary Applications. If the Executive Officer determines that the diesel emission control strategy is technologically sound and appropriate for the intended application, he may grant a conditional verification for off-road and stationary applications upon completion of 33 percent of the minimum durability period. In making this determination, the Executive Officer may consider all relevant information including, but not limited to, the following: the design of the diesel emission control system, filter and catalyst substrates used, similarity of the system under consideration to verified systems, the intended application of the diesel emission control system, other relevant testing data, and field experience. Where conditional verification is granted, full verification must be obtained by

completing the durability testing and all other remaining requirements. These requirements must be completed within a year after receiving conditional verification. For the aforementioned time period, conditional verification is equivalent to verification for the purposes of satisfying the requirements of in-use emission control regulations.

- (m) Failure During the Durability Demonstration Period. If the diesel emission control strategy fails to maintain its initial verified percent emission reduction or emission level for any reason, the Executive Officer may downgrade the strategy to the verification level which corresponds to the lowest degraded performance observed in the durability demonstration period. If the diesel emission control strategy fails to maintain at least a 25 percent PM reduction or 25 percent NOx reduction at any time during the durability period, the diesel emission control strategy will not be verified. If the diesel emission control strategy fails in the course of the durability demonstration period, the applicant must submit a report explaining the circumstances of the failure within 90 days of the failure. The Executive Officer may then determine whether to deny verification or allow the applicant to correct the failed diesel emission control strategy and either continue the durability demonstration or begin a new durability demonstration.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, 43105, 43600 and 43700, Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5 Health and Safety Code; and Title 17 California Code of Regulations Section 93000.

#### **§ 2705. Field Demonstration Requirements.**

- (a) The applicant must demonstrate compatibility of its diesel emission control strategy in the field with at least one vehicle or piece of equipment belonging to the initial emission control group for which it seeks verification. Note that if the durability demonstration selected by the applicant is in-field, it may be used to satisfy the field demonstration requirement for that emission control group.
  - (1) Compatibility is determined by the Executive Officer based on the third-party statement (see part (c) of this section) and any other data submitted including backpressure data. A diesel emission control strategy is compatible with the chosen application if it:
    - (A) Does not cause damage to the engine or engine malfunction
    - (B) Does not cause backpressure outside of the engine manufacturer's specified limits or which results in any damage to the engine
    - (C) Does not hinder or detract from the vehicle or equipment's ability to perform its normal functions

- (D) Is physically intact and well mounted with no signs of leakage or other visibly detectable problems
  - (2) To determine whether additional emission control groups require separate field demonstrations, the Executive Officer may consider all relevant information, including, but not limited to existing field experience and engineering justification and analysis.
- (b) Test Period.
- (1) For on- and off-road engines, and stationary engines not used in emergency generators, a vehicle or piece of equipment must be operated with the diesel emission control strategy installed for a minimum period of 200 hours or 10,000 miles, whichever occurs first.
  - (2) For stationary emergency standby engines, the emission control system must remain in the field for at least 30 days and operation must include:
    - (A) 12 maintenance runs (allowing for engine cool down between runs), and
    - (B) a minimum of two separate 4 hour sessions where the engine is operated under load (allowing engine cool down between runs).
- (c) Reporting Requirements.
- (1) Temperature and Backpressure Measurement Requirements. For strategies that include exhaust aftertreatment, engine backpressure and exhaust temperature must be measured and recorded over the entire demonstration period. The applicant must propose a measurement and recording protocol for approval by the Executive Officer. The protocol may include, but is not limited to, measurement and recording of values once every few seconds, or higher frequency measurement with recording of averages, minima, and maxima over longer time intervals. Data must be submitted electronically in columns as a text file or another format approved by the Executive Officer.
  - (2) NO<sub>x</sub> Emissions Measurement Requirements. For strategies that include exhaust aftertreatment to reduce emissions of NO<sub>x</sub>, the mass emissions of NO<sub>x</sub> both upstream and downstream of the aftertreatment device must be measured and recorded over the entire demonstration period. The applicant must propose a measurement method for approval by the Executive Officer. The method may include, but is not limited to, the use of NO<sub>x</sub> sensors before and after the device. Measurements of NO<sub>x</sub> emissions must occur on at least a 1 Hertz basis. Data must be recorded as averages over time intervals no greater than 10 seconds. Data must be submitted electronically in columns as a text file or another format approved by the Executive Officer.
  - (3) Third Party Statement. The applicant must provide a written statement from a third party approved by the Executive Officer, such as the owner or operator of the vehicle or equipment used in the field demonstration. The written statement must be provided at the end of the test period and must describe the following aspects of the field demonstration: overall

performance of the test application and the diesel emission control strategy, maintenance performed, problems encountered, and any other relevant information. The results of a visual inspection conducted by the third party at the end of the demonstration period must also be described. The description should comment on whether the diesel emission control strategy is physically intact, securely mounted, leaking any fluids, and should include any other evaluative observations.

- (d) Failure During the Field Demonstration. If the diesel emission control strategy fails in the course of the field demonstration, the applicant must submit a report explaining the circumstances of the failure within 90 days of the failure. The Executive Officer may then determine whether to deny verification or allow the applicant to correct the failed diesel emission control strategy and either continue the field demonstration or begin a new demonstration.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, 43105, 43600 and 43700, Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5 Health and Safety Code; and Title 17 California Code of Regulations Section 93000.

#### **§ 2706. Other Requirements.**

- (a) Limit and Procedure for Measuring Nitrogen Dioxide (NO<sub>2</sub>).
- (1) In order for a diesel emission control strategy to be verified, effective January 1, 2007, the diesel emission control strategy must not increase emissions of NO<sub>2</sub> by more than an increment equivalent in mass to 30 percent of the baseline NO<sub>x</sub> emission level. Effective January 1, 2009, the increment is reduced to 20 percent of the baseline NO<sub>x</sub> emission level. The average of NO<sub>2</sub> emission levels from both the initial and final emissions tests described in Section 2704(g) is used to determine compliance with the NO<sub>2</sub> limit. For chassis dynamometer testing, only the NO<sub>2</sub> emission level over the UDDS cycle is used. The first NO<sub>2</sub> emission limit takes effect beginning on January 1, 2007. Diesel emission control strategies verified and installed prior to January 1, 2007 are exempted from this requirement. Those verified prior to January 1, 2007 will no longer be allowed for installation after January 1, 2007 unless they meet the appropriate NO<sub>2</sub> emission limit. After January 1, 2007, all diesel emission control strategies verified and installed must meet this requirement.
- (2) NO<sub>2</sub> emissions are to be quantified by one of the following methods:
- (A) Two chemiluminescence analyzers,
  - (B) A dual-path chemiluminescence analyzer, or
  - (C) An alternative method approved by the Executive Officer.
- (3) Analyzer configuration and determination of NO<sub>2</sub> emission level. For (2)(A) and (2)(B), the analyzers are to be fed from a heated and



conditioned sample path. If two chemiluminescence analyzers are employed, they are to be simultaneously fed from a common heated sample path. One instrument (or path) shall be set to NO<sub>x</sub> mode, while the second shall be set to nitric oxide (NO) mode. The instrument (or path) set to NO<sub>x</sub> mode receives a sample that has passed through an NO<sub>2</sub>-to-NO converter, and the resultant concentration is designated as total NO<sub>x</sub> (NO+NO<sub>2</sub>) in the sample. The instrument (or path) that is set to NO mode receives a sample that has not passed through the converter and quantifies the amount of NO only. The difference between NO and NO<sub>x</sub> is the amount of NO<sub>2</sub> in the sample. Both NO and NO<sub>x</sub> signals are recorded by an external data acquisition system at 1 Hertz. Using the average concentrations of NO and NO<sub>x</sub> over the entire test cycle, the conventional equation for calculating total NO<sub>x</sub> (Code of Federal Regulations, Title 40, part 86, Subpart N) is then used to generate a gram per mile or g/bhp-hr value for both NO and NO<sub>x</sub>. The resulting value for NO is then subtracted from that for NO<sub>x</sub> to determine the gram per mile or g/bhp-hr value for NO<sub>2</sub>. The instrument for measuring NO and NO<sub>x</sub> must be calibrated in accordance with the NO<sub>x</sub> calibration procedure as described in the Code of Federal Regulations, Title 40, part 86, Subpart N.

- (4) Pre-conditioning requirements. If the Executive Officer determines that a diesel emission control system has a propensity to increase emissions of NO<sub>2</sub> and that NO<sub>2</sub> emissions from a diesel emission control system could be affected by the presence of particulate matter or ash (as with a catalyzed diesel particulate filter), the system must be preconditioned according to the following procedure:

(A) Initial test (prior to service accumulation). Before conducting the initial emissions test, the unit being tested must be pre-conditioned as follows:

1. Install a new, unused unit on an engine that is an appropriate size for the unit, in a good state of maintenance, and certified to a PM standard equal to or more stringent than that of the engines in the emission control group for which the applicant seeks verification.
2. Operate the engine on one of the test cycles specified below for 25 to 30 hours. For on-road verifications, use either the FTP (hot-start) or UDDS cycle as identified in 2703(e), or the 13-mode Supplemental Emissions Test (SET) in the Code of Federal Regulations, Title 40, Part 86. For off-road and stationary verifications, use either the steady-state test cycle or the Nonroad Composite Transient Cycle (NRTC) (California Code of Regulations, Title 13, Section 2423 and the incorporated California Exhaust Emissions Standards and Test Procedures for New 2008 and Later Tier 4 Off-Road Compression-Ignition Engines, Part I-C) from ARB off-road regulations. For up to 10 hours of the 25 to 30 hour period, beginning after at least the first three test cycle repetitions or ending before at least the last three test cycle repetitions, an applicant may alternatively:

- a. Run the engine at high load such that the exhaust temperature is between 350 and 450 degrees Celsius, or
    - b. Alternate back and forth between high and low loads such that the exhaust temperature never exceeds 525 degrees Celsius and the low load operation does not result in significant soot accumulation at the end of the pre-conditioning period.
  3. Measure and record the backpressure and exhaust temperature on a second-by-second basis (1 Hertz) for the duration of the 25 to 30 hour pre-conditioning period. Determine the average backpressure for at least the first three and last three test cycle repetitions.
  4. Following the 25 to 30 hour period of operation, remove the unit from the pre-conditioning engine and install it on the emissions test engine, if applicable. Proceed with the initial emissions test and determine  $\text{NO}_2^i$ , as defined in section 2706(a)(5). Determine the average backpressure over each of the emissions test repetitions and then average those values. The resulting average backpressure is compared with that of the aged unit per subsection (B), below.
- (B) Final test (after the service accumulation). Before conducting the final emissions test, the aged unit may need to be pre-conditioned if the backpressure is too high. The applicant may either first perform the backpressure check described below or directly proceed with the final emissions test with the understanding that the test must be repeated if the backpressure is too high.
1. Backpressure check. Run one hot-start of the emissions test cycle with the aged unit installed on the emissions test engine. If using a chassis dynamometer, run the UDDS. Measure and record the backpressure on a second-by-second basis (1 Hertz) and determine the average. No pollutant measurements are necessary. Proceed with the emissions test as described in subsection (B)(3.) below if either the average backpressure is within 30 percent of the average backpressure recorded for the initial test unit or, for transient test cycles, the backpressure does not exceed 60 inches of water for more than two percent of the time, or, for steady-state test cycles, the backpressure never exceeds 60 inches of water. Otherwise, pre-condition the aged unit as described in subsection (B)(2.) below.
  2. If the backpressure of the aged unit does not comply with the appropriate criterion described in subsection (B)(1.) above, burn off excess soot or clean out excess ash as necessary. Run an additional repetition of the emissions test cycle (hot-start) to check if the unit complies with the backpressure criterion. Repeat as necessary.
  3. Conduct emissions testing with the aged unit. Determine  $\text{NO}_2^f$ , as defined in section 2706(a)(5.). If the backpressure does not comply with the appropriate criterion described in subsection (B)(1.) above,

pre-condition the unit in accordance with subsection (B)(2.) and retest. If the backpressure check in subsection (B)(1.) was conducted prior to emissions testing and the unit was brought into compliance at that time, do not retest.

- (C) In-use compliance testing. Before conducting the first phase of in-use compliance emissions testing, the test units may need to be pre-conditioned. Using the required test cycle, measure and record the backpressure on a second-by-second basis (1 Hertz) over one hot-start test with a cleaned (or pre-conditioned per subsection (A) above) reference unit installed on the engine to be used for in-use compliance testing. The reference unit must be identical to the test units. Measure and record the backpressure of the test units retrieved from the field using the same engine and test cycle (one hot-start) as used with the reference unit. If the backpressure of a given test unit is either within 30 percent of the average backpressure recorded for the reference unit or, for transient test cycles, the backpressure does not exceed 60 inches of water for more than two percent of the time, or, for steady-state test cycles, the backpressure never exceeds 60 inches of water, it does not require pre-conditioning. Otherwise, the test units must be pre-conditioned following subsection (B) above. Other units may not be substituted for the selected test units.
- (D) Determination of backpressure. The applicant must submit the actual recorded backpressure in an electronic format as measured on a second-by-second basis over each test run and over the 25 to 30 hour pre-conditioning period. Prior to calculating the average backpressure over a given test run, however, any negative values caused by the draw of the dilution tunnel must first be zeroed.
- (5) Determination of compliance with the NO<sub>2</sub> limit. Compliance with the NO<sub>2</sub> limit is based on the average incremental increase in NO<sub>2</sub> emissions as determined by the following equation:

$$\text{Percent Increase} = 100\% \times 0.5 \times [(\text{NO}_2^i - \text{NO}_2^b) + (\text{NO}_2^f - \text{NO}_2^b)] / \text{NOx}^b$$

Where “NO<sub>2</sub>” and “NOx” stand for the mass-based emission rates of NO<sub>2</sub> and NOx, respectively, as determined in subsection (a)(3) above, and the superscripts “i”, “f”, and “b” stand for “initial test”, “final test”, and “baseline test”, respectively. For in-use compliance testing, the equation is:

$$\text{Percent Increase} = 100\% \times (\text{NO}_2^c - \text{NO}_2^b) / \text{NOx}^b$$

Where the superscript “c” stands for the in-use compliance emissions testing conducted with the unit installed on the test engine.

- (6) Alternative Method to Measure NO<sub>2</sub>. The applicant may request the Executive Officer to approve an alternative method in place of the required

methods. In reviewing this request, the Executive Officer may consider all relevant information including, but not limited to, the following:

- (A) Correlation of the alternative method with the methods stated in 2(A) or 2(B).
- (B) Body of existing data generated using the alternative method.

(b) Limits on Other Pollutants.

- (1) Limits on non-methane hydrocarbon (NMHC) and NO<sub>x</sub>. In order for a diesel emission control strategy to be verified, the applicant must comply with one of the following:
  - (A) The diesel emission control strategy must not increase the emissions of either NMHC or NO<sub>x</sub> by more than ten percent of the baseline emissions level as reported under section 2708 (a), or
  - (B) For strategies verified prior to July 1, 2006, the applicant must provide sufficient evidence to demonstrate that the sum of NMHC and NO<sub>x</sub> emissions with the strategy implemented does not exceed the baseline emission level sum of NMHC and NO<sub>x</sub> as reported under Section 2708 (a); or
  - (C) For strategies verified on or after July 1, 2006, the applicant must provide atmospheric modeling data which indicates that widespread use of the strategy will not result in an increase in exposure of the public to ozone. The atmospheric model employed must be approved in advance by the Executive Officer.
- (2) Limit on CO.
  - (A) On-road and Off-road (including portable) Engines. In order for a diesel emission control strategy to be verified, the diesel emission control strategy must not increase the emissions of CO greater than the current CO emission standards for new diesel engines adopted by the Air Resources Board and in effect at the time of verification.
  - (B) Stationary Engines. In order for a diesel emission control strategy to be verified, the diesel emission control strategy must either:-
    - 1. Meet the applicable CO standard for off-road engines of the same model year and maximum rated power as specified in the Off-Road Compression-Ignition Engine Standards (title 13, CCR, section 2423). If no standards have been established for an off-road engine of the same model year and maximum rated power as the stationary diesel-fueled CI engine, then the stationary diesel-fueled CI engine shall meet the Tier 1 standard in title 13, CCR, section 2423 for an off-road engine of the same maximum rated power, irrespective of the stationary diesel-fueled CI engine's model; Or
    - 2. Not increase the emissions of CO by more than 10 percent of the baseline emissions level as reported under Section 2708(a).
- (3) Limit on Ammonia (NH<sub>3</sub>). In order for a diesel emission control strategy to be verified, the diesel emission control strategy must not increase the emissions of ammonia to a level greater than 25 parts per million by

volume at the tailpipe on average over any test cycle used to support emission reduction claims.

- (A) Emissions of ammonia are to be quantified with a method subject to approval by the Executive Officer which employs Fourier Transform Infrared (FTIR) spectroscopy. The applicant may request the Executive Officer to approve an alternative method in place of the required method. In reviewing this request, the Executive Officer may consider all relevant information including, but not limited to, consistency with the method required by U.S. EPA and the body of existing data generated using the alternative method.
  - (B) If an applicant does not expect its diesel emission control strategy to increase emissions of ammonia, the applicant may request that the Executive Officer waive the requirement to conduct testing for ammonia emissions. In reviewing the request, the Executive Officer may consider all relevant information including, but not limited to, the principles of operation of the diesel emission control strategy, the existence of a mechanism for ammonia formation, and published emissions data from similar technologies.
  - (C) The strategy must be in compliance with applicable federal, state, and local government requirements relating to ammonia emissions, which may be more stringent than the limit presented here.
- (4) Other Pollutants. In order for a diesel emission control strategy to be verified, the diesel emission control strategy must not increase the emissions of other pollutants by more than ten percent of the baseline emission level as reported under Section 2708(a).
- (c) Fuel Additives. Diesel emission control strategies that use fuel additives must comply with Section 2710 and meet the following additional requirements for verification. Fuel additives must be used in combination with a level 3 diesel particulate filter unless they can be proven to the satisfaction of the Executive Officer to be safe for use alone. In addition, the applicant must meet the following requirements:
- (1) The applicant must submit the exact chemical formulation of the fuel additive,
  - (2) Diesel emission control systems employing the dosing of an additive in conjunction with a diesel particulate filter must include an on-board monitor of the additive level in the reservoir, integrated with the diesel particulate filter. The on-board monitor for fuel additive must include indicators to notify the operator when the additive level becomes low and when the additive tank is empty. In addition, the on-board monitor must be capable of shutting off the supply of additive, if there is a detected diesel particulate filter problem,
  - (3) The applicant must submit to the Executive Officer environmental, toxicological, epidemiological, and other health-related data pertaining to the fuel additive every two years. The Executive Officer will review the data, including any new information, and may revoke the verification if the

data indicate that the fuel additives cause, or are linked, to negative environmental, or health consequences.

- (4) The applicant must conduct additional emission tests of fuel additives.
  - (A) Except as provided in (B) below, the additional emission tests must follow the same test procedures, test cycles, and number of test runs as indicated in Section 2703, except that the concentration of the additive must be at least 50 ppm or 10 times higher than that specified for normal use, whichever is highest. In all other respects, the additive in the high concentration test solutions must be identical to that in the fuel additive submitted for verification.
  - (B) The applicant may petition to use a concentration less than that required in (A), above, if the higher dose would result in catastrophic damage to the engine. The applicant must supply information on the failure modes, and the level of the additive that would trigger failure. The applicant must also supply information and data supporting the highest feasible dose for testing. An increase in emissions is not by itself sufficient to justify a dose lower than that required in (A), above, and must be correlated to potential engine damage. After reviewing this information and any other relevant information, the Executive Officer shall determine if testing at a lower level could be accepted, or if testing must be conducted at 50 ppm or ten times the specified dose rate as required in (A).
- (5) Fuel additives must be in compliance with applicable federal, state, and local government requirements. This requirement includes, but is not limited to, registration of fuel additives with the U.S. EPA.
- (d) Alternative Diesel Fuels. Alternative diesel fuels must be in compliance with applicable federal, state, and local government requirements. This requirement includes, but is not limited to registration of the alternative diesel fuel with the U.S. EPA. The applicant must conduct additional emission tests of alternative diesel fuels if the Executive Officer determines that such tests are necessary. The Executive Officer may consider all factors including, but not limited to, fuel components that could adversely affect emissions reductions and/or the applications to which they are applied.
- (e) Selective Catalytic Reduction (SCR) Systems. A diesel emission control strategy that uses an SCR system to reduce emissions of NO<sub>x</sub> has the following additional requirements:
  - (1) The diesel emission control strategy must include a system to monitor the amount of reductant available and notify the operator when the level is low. The notification must occur and be clearly visible to the operator while the vehicle or equipment is in use.
  - (2) The diesel emission control strategy must include a strong inducement to ensure that the operator maintains a constant supply of reductant to the SCR system. For example, the diesel emission control strategy may include a mechanism to de-rate the engine's maximum power output if the

operator fails to refill the reductant tank. The inducement must be both resistant to tampering and strong enough to ensure an uninterrupted supply of reductant. The applicant must propose an inducement for approval by the Executive Officer.

- (3) The diesel emission control strategy must include a means to ensure that the reductant present in the tank meets the specifications necessary for the SCR system to function properly. The applicant must propose a quality control strategy for approval by the Executive Officer.
- (f) Engine Backpressure and Monitoring. During the emission and durability testing, the applicant must demonstrate that the backpressure caused by its diesel emission control system is within the engine manufacturer's specified limits, or will not result in any damage to the engine. Furthermore,
- (1) If operation of the engine with the diesel emission control system installed will result in a gradual build-up of backpressure exceeding the engine's specified limits over time (such as due to the accumulation of ash in a filter), information describing how the backpressure will be reduced must be included.
  - (2) All filter-based diesel emission control systems must be installed with a backpressure monitor to notify the operator when the high backpressure limit, as specified by the engine manufacturer or included in the verification, is approached. The notification must occur and be clearly visible to the operator while the vehicle or equipment is in use. The applicant must identify the high backpressure limits of the system in its application for verification.
  - (3) The Executive Officer reserves the right to require monitors that identify low backpressure limits in those cases where failures leading to low backpressure are unlikely to be detected, or have the potential to cause environmental damage beyond that caused by the engine prior to being equipped with the emission control strategy (e.g., systems that introduce additives into the fuel).
- (g) Fuel and Oil Requirements. The applicant must specify the fuel and lubricating oil requirements necessary for proper functioning of the diesel emission control system. The applicant must also specify any consequences that will be caused by failure to comply with these requirements, as well as methods for reversing any negative consequences.
- (h) Maintenance Requirements. The applicant must identify all normal maintenance requirements for the diesel emission control system. The applicant must specify the recommended intervals for cleaning and/or replacing components. Any components to be replaced within the defects warranty period must be covered with the original diesel emission control system package or provided free of charge to the customer at the appropriate maintenance intervals. Any normal maintenance items that the applicant does not intend to provide free of charge must be approved by the Executive

Officer (the applicant is not required to submit cost information for these items). In addition, the applicant must specify procedures for proper handling of spent components and/or materials cleaned from the diesel emission control system. If any such materials are hazardous, the applicant must identify them as such in the owner's manual. For filter-based diesel emission control strategies, the applicant must include procedures for resetting any backpressure monitors after maintenance procedures are completed.

(i) Component Swapping and Re-Designation Practices

(1) End User Device Component Swapping Practices.

Applicants may authorize end users to move components of their verified control systems from the original installed configuration and transfer them on to other vehicles or equipment, but only within a common ownership fleet, provided the following provisions are met:

- (A) Applicants must first receive written approval outlining the specific component eligible to be moved from the Executive Officer prior to approving any transfers.
- (B) Recipient vehicle must be fitted with the same DECS.
- (C) Component swapping must also comply with the requirements as described in subsection (i)(3).
- (D) Donor vehicle/engine whose component has been moved must remain in compliance with the terms and conditions of the applicable Executive Order and have all DECS components present and functional.

(2) Device Re-Designation Practices. Applicants may authorize end users to completely remove their verified control systems from the original installed configuration and install them on other vehicles or equipment within the end user's commonly owned fleet, provided the following provisions are met:

- (A) Applicants must receive written approval from the Executive Officer prior to approving a DECS re-designation.
- (B) Any party which removes a verified DECS from an engine/application must remove the verified DECS engine label. If the engine label cannot be removed whole, it must be destroyed.
- (C) Any party which re-designates a device to another engine/application which was never previously retrofit with that exact DECS must obtain and properly install an appropriate DECS engine label.
- (D) Any party which removes a verified DECS from an engine/application must ensure the engine/application returns to its original factory configuration.
- (E) DECS which are more than 10 years old based on the month and date of manufacture listed on the device label, or devices of unknown age, are not legal candidate systems for re-designation to a new engine/application.
- (F) DECS system re-designation must also comply with the requirements as described in subsection (i)(3)



- (3) Additional Component Swapping and Re-designation Requirements. In addition to the specific requirements in subparts (1) and (2), the following requirements must be met prior to the approval of a component swap or device re-designation:
- (A) Applicants must provide written information on approved practices and, compliance with warranty and in-use compliance,
  - (B) Applicants must provide instructions for assessing if the system still meets its verified emissions reductions (for PM and/or NO<sub>x</sub>), instructions for device movement to prevent installation on an inappropriate vehicle, and other information required by the EO to assess the request.
  - (C) The end user must verify that the new recipient vehicle is within the scope of the original verification.
  - (D) Applicants must specify acceptable end user installation and reinstallation practices in the owner's manual and the installation manual (see section 2706(l) and 2706(n)) and possible repercussions to the end user if such practices are done in an inappropriate manner. (See section 2706(i)).
  - (E) The applicant must agree to honor the original warranty and warranty period (see sections 2702 and 2707) and must provide a written statement to the EO confirming continued support of the original warranty.
- (4) Any device installed under the device re-designation provisions above must be compliant with the warranty requirements in section 2707 of the verification procedure. However, if the original device warranty has expired, the installer must issue a warranty to guard against potential installation defects for a period of one year from the date of installation (see section 2707). Any transfer of a device by an installer that does not offer this installation warranty will not be considered a valid installation. No party shall advertise, sell, lease, or offer for sale or lease, a used verified DECS.

(j) System Labeling.

- (1) The applicant must ensure that identical, legible, and durable labels are affixed on both the diesel emission control system and the engine (or an alternate location approved by the Executive Officer) on which the diesel emission control system is installed except as noted in (3) below. The required labels must identify the name, address, and phone number of the manufacturer, the diesel emission control strategy family name (defined in (2) below) of the installed system, a unique serial number, and the month and year of manufacture. The month and year of manufacture are not required on the label if this information can be readily obtained from the applicant by reference to the serial number. The applicant and installer must ensure that the label is affixed such that it is resistant to tampering and degradation from the conditions of its environment. The applicant and/or installer must ensure that the label is visible after installation. In the event that the original system label is damaged or destroyed by the end-

user, the device manufacturer shall issue a replacement. The replacement label must be identical to the original label with the exception of the words "REPLACEMENT LABEL" which must be included at the bottom line of information. A sample scale drawing of the original and replacement labels must be submitted with the verification application. Unless an alternative is approved by the Executive Officer, the label information must be in the following format:

**Name, Address, and Phone Number of Manufacturer**  
**Diesel Emission Control Strategy Family Name**  
**Product Serial Number**  
**ZZ-ZZ** (Month and Year of manufacture, e.g., 06-02)  
**REPLACEMENT LABEL\***

\* "Replacement Label" to be used only when a replacement of the original label has been issued by the device manufacturer.

- (2) Diesel Emission Control Strategy Family Name. Each diesel emission control strategy shall be assigned a family name defined as below:

**CA/MMM/YYYY/PM#/N##/APP/XXXXX**

CA: Designates a diesel emission control strategy verified in California  
MMM: Manufacturer code (assigned by the Executive Officer)  
YYYY: Year of verification  
PM#: PM verification level 0, 1, 1+, 2, 2+, 3, or 3+ (e.g., PM3 means a level 3 PM emission control system).  
N##: NO<sub>x</sub> verified reduction level in percent, if any (e.g., N25 means NO<sub>x</sub> reduction of 25 percent).  
APP: Verified application which may include a combination of On-road (ON), Off-road (OF), or Stationary (ST)  
XXXXX: Five alphanumeric character code issued by the Executive Officer

- (3) The applicant may request that the Executive Officer approve an alternative label format. In reviewing this request, the Executive Officer may consider all relevant information including, but not limited to, the informational content of an alternative label as proposed by the applicant.
- (k) Additional Information. The Executive Officer may require the applicant to provide additional information about the diesel emission control strategy or its

implementation when such information is needed to assess environmental impacts associated with its use.

- (l) Owner's Manual. The applicant must provide a copy of the diesel emission control system owner's manual, which must clearly specify at least the following information:
  - (1) Warranty statement including the warranty period over which the applicant is liable for any defects.
  - (2) Installation procedure and maintenance requirements for the diesel emission control system.
  - (3) Possible backpressure range imposed on the engine.
  - (4) Fuel consumption penalty, if any.
  - (5) Fuel requirements including sulfur limit, if any.
  - (6) Handling and supply of additives, if any.
  - (7) Instructions for reading and resetting the backpressure monitor.
  - (8) Requirements for lubrication oil quality and maximum lubrication oil consumption rate.
  - (9) Contact information for replacement components and cleaning agents.
  - (10) Contact information to assist an end-user to determine proper ways to dispose of waste generated by the diesel emission control strategy (e.g., ash accumulated in filter-based systems). At a minimum, the owner's manual should indicate that disposal must be in accordance with all applicable Federal, State and local laws governing waste disposal.
  - (11) Appropriate methods of removing the diesel emission control system from the original installed configuration and installing the system on a different vehicle or piece of equipment, if such practices are allowed. The applicant must state possible repercussions to the end user if such practices are done in an inappropriate manner. (See section 2706(i))
  - (12) Parts List.
- (m) Noise Level Control. Any diesel emission control system that replaces a muffler must continue to provide at a minimum the same level of exhaust noise attenuation as the muffler with which the vehicle was originally equipped by the vehicle or engine manufacturer. Applicants must ensure that the diesel emission control system complies with all applicable noise limits contained in Part 205, Title 40, Code of Federal Regulations and California Vehicle Code, Sections 27150, 27151 and 27200 through 27207, for the gross vehicle weight rating and year of manufacture of the vehicle for which the diesel emission control strategy is intended. All diesel emission control systems must be in compliance with applicable local government requirements for noise control.
- (n) Installation Manual. The applicant must provide a copy of the diesel emission control system installation manual that the applicant intends to provide to installers and/or owners.

- (o) **Parts List.** The applicant must include a list of all of the component parts of the diesel emission control system. All primary components must be listed, including, but not limited to, substrates, electronic control units, sensors, injectors, pumps, blowers, storage tanks, and notification lights. Brackets, fasteners, and wiring need not be included. For each listed component, the applicant must give a description and identification number. The applicant must also clearly specify which parts, if any, are not covered by the warranty. Parts that may be excluded from warranty coverage are subject to approval by the Executive Officer.
- (p) **Multimedia Assessment for Fuel Strategies.** Diesel emission control strategies which rely on fuel changes either through use of additives or through use of alternative diesel fuels must undergo an evaluation of the multimedia effects. No diesel emission control strategy that relies on the use of an additive or an alternative fuel may be verified unless a multimedia evaluation of the additive or alternative fuel has been conducted and the California Environmental Policy Council established by Public Resources Code section 71017 has determined that such use will not cause a significant adverse impact on the public health or the environment, pursuant to Health and Safety Code section 43830.8. No person shall sell, offer for sale, supply or offer for supply an alternative fuel or a diesel fuel in California that contains an additive for use in a verified diesel emission control strategy unless such a multimedia evaluation has been conducted and resulted in a determination that use of the alternative fuel or additive will not cause a significant adverse impact on the public health and the environment. The applicant shall bear the expense of conducting the multimedia assessment.
- (q) **Sales and Installation.** No person or entity shall advertise, sell, lease, supply, offer for sale, represent, or install any device, apparatus, mechanism, or fuel based system as a verified diesel emission control strategy for or on any engine, vehicle or equipment that does not meet the terms and conditions of the strategy's Executive Order. The applicant, distributor, and/or installer must ensure that each verified diesel emission control strategy is supplied, sold, leased, and installed pursuant to the provisions of the Executive Order. Failure to follow the provisions of the Executive Order may result in revocation or suspension of the verification and/or any other remedy available under Part 5, Division 26 of the Health and Safety Code.
- (r) **Aftertreatment Devices.** Any control strategy that is installed on or after January 1, 2010 that includes an aftertreatment device such as a diesel particulate filter, must be designed such that the aftertreatment device can only be installed on the application in one unique direction. Any new aftertreatment device installed in the period between February 19, 2009 and December 31, 2009 must indicate the proper direction of exhaust flow so the end user or installer can clearly see how to properly install the device.

- (s) Verification of a diesel emission control strategy by the Air Resources Board does not release the applicant from complying with all other applicable legal requirements.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, 43105, 43600, 43700 and 43830.8, Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107, 43204-43205.5 and 43830.8, Health and Safety Code; Section 71017, Public Resources Code; and Title 17 of Regulations Section 93000.

#### **§ 2707. Warranty Requirements.**

(a) (1) Product Warranty.

- (A) The applicant must warrant to all owners, for ownership within the warranty period and lessees, for lease contracts within the warranty period, that its verified diesel emission control strategy is free from defects in design, materials, workmanship, or operation of the diesel emission control strategy which cause the diesel emission control strategy to fail to conform to the emission control performance level it was verified to, or to the other requirements of Sections 2700-2706, and 2710 for the minimum periods shown in Table 5, provided the operation of and conditions of use for the vehicle, equipment, engine, and diesel emission control strategy conform with the operation and conditions specified in the ARB's Executive Order.
- (B) For each engine type and size listed in Table 5, the minimum defects warranty period is terminated by that listed event which occurs first. The warranty must cover the full repair or replacement cost of the diesel emission control strategy, including parts and labor.
- (C) The warranty must also cover the full repair or replacement cost of returning engine components to the condition they were in prior to the failure, including parts and labor, for damage to the engine proximately caused by the verified diesel emission control strategy. Repair or replacement of any warranted part, including the engine must be performed at no charge to the vehicle or engine owner. This includes only those relevant diagnostic expenses in the case in which a warranty claim is valid. The applicant may, at its option, instead pay the fair market value of the engine prior to the time the failure occurs.
- (D) The repair or replacement of any warranted part otherwise eligible for warranty coverage may be excluded from such warranty coverage if the diesel emission control strategy, vehicle or engine has been abused, neglected, or improperly maintained, and that such abuse, neglect, or improper maintenance was the direct cause of the need for the repair or replacement of the part.

(E) Failure of the vehicle or engine owner to ensure scheduled maintenance or to keep maintenance records for the vehicle, equipment, engine, or diesel emission control strategy may, but shall not per se, be grounds for disallowing a warranty claim.

(2) Installation Warranty

- (A) A person or company who installs a verified diesel emission control strategy must warrant that the installation is free from defects in workmanship or materials which cause the diesel emission control strategy to fail to conform to the emission control performance level it was verified to or the other requirements of sections 2700-2706 for the minimum time periods shown in Table 5.
- (B) For each engine type and size listed in Table 5, the minimum defects warranty period is terminated by that listed event whichever occurs first. The extent of the warranty coverage provided by installers must be the same as the warranty provided by the applicant as established in subsection (a)(1) and the same exclusions must apply.

Table 5. Minimum Warranty Periods

| Engine Type   | Engine Size  | Minimum Warranty Period  |
|---|--|--------------------------|
| On-Road   | Light heavy-duty, 70 to 170 hp, Gross Vehicle Weight Rating (GVWR) less than 19,500 lbs.   | 5 years or 60,000 miles  |
|   | Medium heavy-duty, 170 to 250 hp, GVWR from 19,500 lbs. to 33,000 lbs.   | 5 years or 100,000 miles |
|   | Heavy heavy-duty, exceeds 250 hp, GVWR exceeds 33,000 lbs.   | 5 years or 150,000 miles |
|   | Heavy heavy-duty, exceeds 250 hp, GVWR exceeds 33,000 lbs., and the truck is:<br>1. Typically driven over 100,000 miles per year, and<br>2. Has less than 300,000 miles on the odometer at the time of installation. | 2 years, unlimited miles |
| Off-Road (includes portable engines) and Stationary | Under 25 hp, and for constant speed engines rated under 50 hp with rated speeds greater than or equal to 3,000 rpm   | 3 years or 1,600 hours   |
|   | At or above 25 hp and under 50 hp  | 4 years or 2,600 hours   |
|   | At or above 50 hp  | 5 years or 4,200 hours   |

(b)(1) Product Warranty Statement. The applicant must furnish a copy of the following statement in the owner's manual. The applicant may include

descriptions of circumstances that may result in a denial of warranty coverage, but these descriptions shall not limit warranty coverage in any way.

#### YOUR WARRANTY RIGHTS AND OBLIGATIONS

(Applicant's name) must warrant the diesel emission control system in the application for which it is sold or leased to be free from defects in design, materials, workmanship, or operation of the diesel emission control system which cause the diesel emission control system to fail to conform to the emission control performance level it was verified to, or to the requirements in the California Code of Regulations, Title 13, Sections 2700 to 2706, and 2710, for the periods of time listed below, provided there has been no abuse, neglect, or improper maintenance of your diesel emission control system, vehicle or equipment, as specified in the owner's manuals. Where a warrantable condition exists, this warranty also covers the engine from damage caused by the diesel emission control system, subject to the same exclusions for abuse, neglect or improper maintenance of your vehicle or equipment. Please review your owner's manual for other warranty information. Your diesel emission control system may include a core part (e.g., particulate filter, diesel oxidation catalyst, selective catalytic reduction converter) as well as hoses, connectors, a back pressure monitor (if applicable), and other emission-related assemblies. Where a warrantable condition exists, (applicant's name) will repair or replace your diesel emission control system at no cost to you including diagnosis, parts, and labor.

#### WARRANTY COVERAGE:

For a (engine size) engine used in a(n) (type of application) application, the warranty period will be (years or hours or miles of operation) whichever occurs first. If any emission-related part of your diesel emission control system is defective in design, materials, workmanship, or operation of the diesel emission control system thus causing the diesel emission control system to fail to conform to the emission control performance level it was verified to, or to the requirements in the California Code of Regulations, Title 13, Sections 2700 to 2706, and 2710, within the warranty period, as defined above, (Applicant's name) will repair or replace the diesel emission control system, including parts and labor.

In addition, (applicant's name) will replace or repair the engine components to the condition they were in prior to the failure, including parts and labor, for damage to the engine proximately caused by the verified diesel emission control strategy. This also includes those relevant diagnostic expenses in the case in which a warranty claim is valid. (Applicant's name) may, at its option, instead pay the fair market value of the engine prior to the time the failure occurs.

### OWNER'S WARRANTY RESPONSIBILITY

As the (vehicle, engine, equipment) owner, you are responsible for performing the required maintenance described in your owner's manual. (Applicant's name) recommends that you retain all maintenance records and receipts for maintenance expenses for your vehicle, engine, or equipment, and diesel emission control system. If you do not keep your receipts or fail to perform all scheduled maintenance, (applicant's name) may have grounds to deny warranty coverage. You are responsible for presenting your vehicle, equipment, or engine, and diesel emission control system to a (applicant's name) dealer as soon as a problem is detected. The warranty repair or replacement should be completed in a reasonable amount of time, not to exceed 30 days. If a replacement is needed, this may be extended to 90 days should a replacement not be available, but must be performed as soon as a replacement becomes available.

If you have questions regarding your warranty rights and responsibilities, you should contact (Insert chosen applicant's contact) at 1-800-xxx-xxxx or the California Air Resources Board at 9528 Telstar Avenue, El Monte, California 91731, or (800) 363-7664, or electronic mail: [helpline@arb.ca.gov](mailto:helpline@arb.ca.gov).

- (2) Installation Warranty Statement. The installer must furnish the owner with a copy of the following statement.

### YOUR WARRANTY RIGHTS AND OBLIGATIONS

(Installer's name) must warrant that the installation of a diesel emission control system is free from defects in workmanship or materials which cause the diesel emission control system to fail to conform to the emission control performance level it was verified to, or to the requirements in the California Code of Regulations, Title 13, Sections 2700 to 2706. The warranty period and the extent of the warranty coverage provided by (installer's name) must be the same as the warranty provided by the product manufacturer, and the same exclusions must apply.

### OWNER'S WARRANTY RESPONSIBILITY

As the vehicle, engine, or equipment owner, you are responsible for presenting your vehicle, engine, or equipment, and diesel emission control system to (installer's name) as soon as a problem with the installation is detected.

If you have questions regarding your warranty rights and responsibilities, you should contact (Insert chosen installer's contact) at 1-800-xxx-xxxx or the California Air Resources Board at 9528 Telstar Avenue, El Monte, California 91731, or (800) 363-7664, or electronic mail: [helpline@arb.ca.gov](mailto:helpline@arb.ca.gov).



- (c) Diesel Emission Control Strategy Warranty Report. The applicant must submit a warranty report to the Executive Officer by April 1 of each calendar year. The applicant must also submit a warranty report within 30 calendar days if warranty claims exceed four percent of the number of diesel engines using the diesel emission control strategy. The warranty report must include the following information:
- (1) Annual and cumulative sales, and annual and cumulative leases of diesel emission control systems (California only).
  - (2) Annual and cumulative production of diesel emission control systems (California only).
  - (3) Annual summary of warranty claims (California only). The summary must include:
    - (A) A description of the nature of the claims and of the warranty replacements or repairs. The applicant must categorize warranty claims for each diesel emission control strategy family by the component(s) replaced or repaired.
    - (B) The number and percentage of diesel emission control systems of each model for which a warranty replacement or repair was identified.
    - (C) A short description of the diesel emission control system component that was replaced or repaired under warranty and the most likely reason for its failure.
  - (4) Date the warranty claims were filed and the engine family and application the diesel emission control systems were used with.
  - (5) Delineate the reason(s) for any instances in which warranty service is not provided to end-users that file warranty claims.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, 43105, 43600 and 43700, Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107, and 43204-43205.5 Health and Safety Code; Title 17 California Code of Regulations Section 93000.

#### **§ 2708. Determination of Emissions Reduction.**

- (a) Calculation of Emissions Reduction. The emissions reduction verified for a diesel emission control strategy is based on the average of all valid test results before (baseline) and after (control) implementation of the diesel emission control strategy. Test results from both emission testing and durability testing are to be used. If the applicant chooses to perform either the initial or the final durability baseline test, but not both, it must use those results to calculate the reductions obtained in both the initial and final control tests.
- (1) Percentage Reduction. The percentage reduction for a given pair of baseline and control test sets (where a "set" consists of all test cycle repetitions, e.g., the test set of 3 hot-start UDDS tests) is the difference between the average baseline and average control emissions divided by the average baseline emissions, multiplied by 100 percent. The average

of all such reductions, as shown in the equation below, is used in the verification of a diesel emission control strategy.

$$\text{Percentage Reduction} = 100\% \times \frac{\sum [(baseline_{AVG} - control_{AVG})/baseline_{AVG}]}{\text{Number of control test sets}}$$

Where:

$\Sigma$  = sum over all control test sets  
 $baseline_{AVG}$  or  $control_{AVG}$  = average of emissions from all  
baseline or control test repetitions  
within a given set

(A) For any test set involving cold and hot starts, the time weighted emission result is to be calculated by weighting the cold-start emissions by one-seventh (1/7) and the hot-start emissions by six-sevenths (6/7) as shown below.

$$\text{Weighted Emission Result} = 1/7 * \text{average cold-start emissions} + 6/7 * \text{average hot-start emissions}$$

(B) For applicants seeking verification of NOx reductions from on-road applications, weighted test results from the additional test set described in subsection 2703(e)1(C) are included in the percentage reduction equation above. The Executive Officer shall determine an appropriate weighting factor in consultation with the applicant based on factors including, but not limited to, the amount of time that vehicles within the selected emission control group have elevated NOx emissions and the breadth of engines and applications encompassed by the emission control group.

(2) The absolute emission level is the average control emission level, as defined in the following equation:

$$\text{Absolute Emission Level} = \frac{\sum (control_{AVG})}{\text{Number of control test sets}}$$

(b) Categorization of the Diesel Emission Control Strategy. The Executive Officer shall categorize diesel emission control strategies to reduce PM and NOx emissions based on their verified emission reductions. Diesel emission control strategies that reduce NOx will be assigned their verified emission reduction

(Mark 1, 2, 3, 4, or 5) in 15 percent increments starting at 25 percent (See Table 1 in section 2702). Diesel emission control strategies are categorized by their PM reductions as follows:

- (1) Level zero: the system has been demonstrated under these procedures to reduce PM emissions by less than 25 percent from the baseline emission level and to reduce NOx emissions by at least 25 percent from the baseline emission level.
- (2) Level one: the system has been demonstrated under these procedures to reduce PM emissions by at least 25 percent from the baseline emission level.
- (3) Level two: the system has been demonstrated under these procedures to reduce PM emissions by at least 50 percent from the baseline emission level.
- (4) Level three: the system has been demonstrated under these procedures to reduce PM emissions by at least 85 percent from the baseline emission level, or to achieve PM emission levels of 0.01 grams per brake-horsepower-hour (g/bhp-hr) or less.

Diesel emission control strategies are categorized by their NOx reductions as follows:

- (1) Mark 1: the system has been demonstrated under these procedures to reduce NOx emissions by at least 25 percent from the baseline emission level.
- (2) Mark 2: the system has been demonstrated under these procedures to reduce NOx emissions by at least 40 percent from the baseline emission level.
- (3) Mark 3: the system has been demonstrated under these procedures to reduce NOx emissions by at least 55 percent from the baseline emission level.
- (4) Mark 4: the system has been demonstrated under these procedures to reduce NOx emissions by at least 70 percent from the baseline emission level.
- (5) Mark 5: the system has been demonstrated under these procedures to reduce NOx emissions by at least 85 percent from the baseline emission level.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, 43105, 43600 and 43700, Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code; and Title 17 California Code of Regulations Section 93000.

#### **§ 2709. In-Use Compliance Requirements.**

- (a) Applicability. These in-use compliance requirements apply to all diesel emission control strategies for on-road, off-road, and stationary applications. It is the responsibility of the applicant to perform in-use compliance testing for each verified diesel emission control strategy family (see Section 2706 (j) (2)).

Testing is required when 50 units within a given diesel emission control strategy family have been sold or leased in the California market. Applicants must submit an in-use compliance testing proposal for approval by the Executive Officer prior to the in-use compliance testing. Applicants who have sold 50 units or more but have less than 50 units installed may submit a request for the Executive Officer to delay the in-use compliance deadlines specified in this section.

- (b) Test Phases. In-use compliance testing, as described below in subsections (d), (e), (f), and (g), must be conducted per an approved in-use compliance testing proposal at two different phases for each diesel emission control strategy family:
  - (1) Phase 1. Applicants must obtain and test diesel emission control systems once they have been operated for at least 25 percent of their minimum warranty period or for one year, whichever comes first.
  - (2) Phase 2. Applicants must obtain and test diesel emission control systems once they have been operated between 60 and 80 percent of their minimum warranty period. For all systems used with heavy heavy-duty vehicles, the 60 to 80 percent window must be applied to the 5 year or 150,000 mile minimum warranty period.
- (c) In-Use Compliance Testing Proposal. The applicant must submit to the Executive Officer a Phase 1 in-use compliance testing proposal no later than 90 days after selling the 50<sup>th</sup> unit. The applicant must submit a Phase 2 in-use compliance testing proposal to the Executive Officer no later than 3 years after the 50<sup>th</sup> unit is sold. The following information must be included in both testing proposals:
  - (1) Applicant identification.
  - (2) Diesel emission control strategy family name.
  - (3) Parties to be involved in conducting in-use compliance tests.
  - (4) Test facility identification and description.
  - (5) Quality control and quality assurance procedures for the test equipment.
  - (6) List of candidate test units (at least 10 choices per phase) with the following information for each: vehicle/equipment information on which the unit is installed (make, model, model year), location, engine information (family name, make, series, model year, displacement), date of manufacture, date of installation, and cleaning/repair history.
  - (7) Cumulative sales of the emission control strategy family in each application.
  - (8) Predicted mileage or hours of use each diesel emission control system will have accrued by the time it is obtained by the applicant of diesel emission control strategy testing.
  - (9) Description of test vehicles and engines (engine family name, make, model, model year, displacement)
  - (10) Testing plan for meeting the requirements of part (g) below.

Within 45 days of receipt of the completed testing proposal, the Executive Officer shall determine whether the applicant has an appropriate testing proposal to support in-use compliance testing. The in-use testing proposal will not be considered approved until the Executive Officer issues the applicant a letter of approval. If the Executive Officer determines that the testing proposal is insufficient or inappropriate, the applicant must, within 30 days, submit a revised testing proposal.

- (d) Selection of Diesel Emission Control Systems for Testing. For each diesel emission control strategy family and for both test phases, the applicant must propose a representative sample of installed diesel emission control systems for in-use compliance testing based on information provided per Section 2709(c) to be approved by the Executive Officer. The selected diesel emission control systems should come from a representative sample of engines or vehicles equipped with the control systems. The engines or vehicles equipped with the selected diesel emission control systems must have good maintenance records and may receive a tune-up or normal maintenance prior to the applicant obtaining the diesel emission control systems for testing. The applicant must obtain information from the end users regarding the diesel emission control systems' accumulated mileage or hours of usage, maintenance records (to the extent practicable), operating conditions and a description of any unscheduled maintenance that may affect the emission results.
- (e) Selection of Test Engines. The Executive Officer must approve the appropriate test engines or vehicles for in-use compliance testing. The applicant must provide candidate test vehicles/engines for the Executive Officer's review. If the Executive Officer determines that a diesel emission control system affects the performance of the engine, the Executive Officer may require the applicant to test the selected diesel emission control system with the engine on which it is installed. The applicant may tune-up or rebuild test engines prior to, but not after, baseline testing unless rebuilding the engine is an integral part of the diesel emission control strategy. All testing should be performed with the test engine in a proper state of maintenance. Emissions of NO<sub>2</sub> from the test engine must not exceed 15 percent of the total baseline NO<sub>x</sub> emissions by mass. If there is a special category of engines with NO<sub>2</sub> emission levels that normally exceed 15 percent, this requirement may be adjusted for those engines at the discretion of the Executive Officer.
- (f) Number of Diesel Emission Control Systems to be Tested. The number of diesel emission control systems an applicant must test in each of the two test phases will be determined as follows:
  - (1) A minimum of four diesel emission control systems in each diesel emission control strategy family must be tested. For every system tested

that does not reduce emissions by at least 90 percent of the lower bound of its initial verification level (or does not achieve an emission level less than or equal to 0.011 g/bhp-hr of PM) or does not meet the NO<sub>2</sub> requirement in section 2709(k), two more diesel emission control systems from the same family must be obtained and tested. The total number of systems tested shall not exceed ten per diesel emission control strategy family.

- (2) At the discretion of the Executive Officer, applicants may begin by testing more than the minimum of four diesel emission control systems. Applicants may concede failure of an emission control system before testing a total of ten diesel emission control systems.

(g) In-use Compliance Emission Testing. Applicants must follow the testing procedure used for emission reduction verification as described in Section 2703 (both baseline and control tests are required). As provided in Section 2709(h), the applicant may request the Executive Officer to review and approve an alternative testing procedure. If a diesel emission control strategy verified by U.S. EPA must perform engine dynamometer testing with the Heavy-duty Transient FTP cycle to fulfill the in-use compliance requirements of that program, but was verified by the Executive Officer with chassis dynamometer testing, the Executive Officer will also accept testing with the Heavy-duty Transient FTP cycle for the in-use compliance requirements of this Procedure.

(h) Alternative Test Cycles and Methods. The Executive Officer may consider, on a case by case basis, an alternative test plan or method for applicants to satisfy the in-use compliance requirements of this section. The proposed alternative test plan must be as scientifically sound as the testing described in Section 2709(g) of the Procedure and it must produce accurate results that will indicate if the emission control system reduces emissions to the level for which it was verified. Use of an alternative test procedure must be approved by the Executive Officer.

(i) In-Use Compliance Report. The applicant must submit an in-use compliance report to the Executive Officer after each phase of testing. The applicant must submit the phase 1 report within 18 months from when the 50<sup>th</sup> unit is sold. The phase 2 report must be submitted within 4 years from when the 50<sup>th</sup> unit is sold. The following information must be reported for each of the minimum of four diesel emission control systems tested:

- (1) Parties involved in conducting the in-use compliance tests.
- (2) Quality control and quality assurance information for the test equipment.
- (3) Diesel emission control strategy family name and manufacture date.
- (4) Vehicle or equipment and type of engine (engine family name, make, model year, model, displacement, etc.) the diesel emission control system was applied to.
- (5) Mileage or hours the diesel emission control system was in use.

- (6) Results of all emission testing.
  - (7) Summary of all maintenance, adjustments, modifications, and repairs performed on the diesel emission control system.
- (j) The Executive Officer may request the applicant to perform additional in-use testing if the warranty claims exceed four percent of the number of diesel engines using the diesel emission control strategy, or based on other relevant information. As noted in Section 2707(c), if warranty claims exceed four percent of the number of diesel engines using the diesel emission control strategy, the applicant must notify the Executive Officer and submit a warranty report within 30 calendar days of that time.
- (k) Conditions for Passing In-Use Compliance Testing. For a diesel emission control strategy to pass in-use compliance testing, emission test results must indicate that the strategy reduced emissions by at least 90 percent of the lower bound of the emission reduction level the Executive Officer originally verified it to. In addition, the strategy must meet the requirements of section 2706(a) with the exception that the strategy must not increase emissions of NO<sub>2</sub> by more than an increment equivalent in mass to 33 or 22 percent of the baseline NO<sub>x</sub> emission level for systems verified under the 30 or 20 percent NO<sub>2</sub> limits, respectively. If the first four diesel emission control systems tested within a diesel emission control strategy family meet both of these standards, the diesel emission control strategy passes in-use compliance testing. If any of the first four diesel emission control systems tested within a diesel emission control strategy family fail to meet either of these standards, and more than four units are tested, at least 70 percent of all units tested must meet both standards for the diesel emission control strategy family to pass in-use compliance testing. For each failed test, for which the cause of failure can be attributed to the product and not to maintenance or other engine-related problems, two additional units must be tested, up to a total of ten units per diesel emission control strategy family. Within 30 days of a test unit failing, the applicant must submit to the Executive Officer for approval a testing proposal for the additional test units that is compliant with part (c) above. The testing proposal must include an investigative report detailing the causes of the failure. The Executive Officer shall, within 45 days of its receipt, determine whether the test plan is acceptable. After receiving approval from the Executive Officer, the applicant must complete testing.
- (l) Failure of In-use Compliance Testing. If a diesel emission control strategy family does not meet the minimum in-use compliance requirements of this section, the applicant must submit a remedial report within 90 days after the in-use compliance report is submitted. The remedial report must include:
- (1) Summary of the in-use compliance report.
  - (2) Detailed analysis of the failed diesel emission control systems and possible reasons for failure.

- (3) Remedial measures to correct or replace failed diesel emission control systems as well as the rest of the in-use diesel emission control systems.
- (m) The Executive Officer shall evaluate the remedial report, annual warranty report, and all other relevant information to determine if the diesel emission control strategy family satisfies the in-use compliance requirements. The Executive Officer may request additional information from the applicant. Based on this review, the Executive Officer may lower the verification level or revoke the verification status of a verified diesel emission control strategy family. The Executive Officer may also lower the verification level or revoke the verification status of a verified diesel emission control strategy family, if the applicant does not conduct in-use compliance testing in accordance with this section, or if the Executive Officer conducts in-use compliance testing in accordance with this section (including alternative testing) and the diesel emission control strategy family does not pass the standards in this section.
- (n) The Executive Officer may lower the verification level or revoke the verification status of a verified diesel emission control strategy family if the applicant fails to observe the requirements of Sections 2706 or 2707. The Executive Officer must allow the applicant an opportunity to address the possible lowering or revocation of the verification level in a remedial report to the Executive Officer and the Executive Officer may make this determination based on all relevant information.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, 43105, 43600 and 43700, Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code; and Title 17 California Code of Regulations Section 93000.

#### **§ 2710. Verification of Emission Reductions for Alternative Diesel Fuels and Fuel Additives**

- (a) Applicability. This section applies to in-use strategies that include emission reductions from the use of alternative diesel fuels or fuel additives. The requirements in this section are in addition to those in Sections 2700-2709, except as specifically noted.
- (b) Alternative Diesel Fuel and Fuel Additive Proposed Test Protocol. The applicant must submit a proposed test protocol which includes:
  - (1) References to criteria pollutant and toxic emissions sampling and analyses that are consistent with the requirements of Section 2703.
  - (2) Description and Parameters of Alternative Diesel Fuels and Fuel Additives.



- (A) The applicant must describe the applicability of the alternative diesel fuel or fuel additive to diesel engines and identify any requirements for engine or fuel system modifications.
- (B) The applicant must provide a general description of the alternative diesel fuel or fuel additive that includes the fuel type, fuel characteristics, fuel properties, fuel formulation, and chemical composition. The applicant for the candidate alternative diesel fuel or fuel additive must specify the following:
  - 1. Identity, chemical composition, and concentration of fuel additives
  - 2. Sulfur content
  - 3. Total aromatic content
  - 4. Total polycyclic aromatic hydrocarbon content
  - 5. Nitrogen content
  - 6. API gravity (density)
  - 7. Distillation temperature distribution information, initial boiling point (IBP),
  - 8. 10% recovered (REC), 50% REC, 90% REC, and end point (EP)
- (C) The applicant must provide information on the candidate alternative diesel fuel or fuel additive that may affect engine performance, engine wear, and safety. The applicant for the candidate alternative diesel fuel or fuel additive must specify the following:
  - 1. Viscosity (engine performance)
  - 2. Fuel volatility (engine performance)
  - 3. Ignition quality (engine performance)
  - 4. Fuel operating temperatures (engine performance)
  - 5. Engine wear tendencies (engine wear)
  - 6. Corrosion (engine wear)
  - 7. Lubricity (engine wear)
  - 8. Fuel flash point (safety)
- (D) The applicant must provide information on the candidate alternative diesel fuel or fuel additive to determine if there are chemicals in the fuel or fuel additive that may increase levels of toxic compounds or potentially form toxic compounds in the fuel or fuel additive. The applicant will conduct an analysis for metals and elements by a method specified by the applicant. Copper, iron, cerium, lead, cadmium, chromium, and phosphorus must be included in the analysis. Additional analysis for other toxic compounds may be required after reviewing the chemical composition of the candidate alternative diesel fuel and its additives or fuel additive (Note: For alternative diesel fuels or fuel additives that are in part comprised of standard diesel fuel, such as emulsified diesel fuels, a toxic analysis of the diesel base fuel is not necessary).
- (E) With the approval of the Executive Officer or designee, an applicant may also specify different fuel parameters and test methods that are appropriate to better characterize the candidate alternative diesel fuel or fuel additive.

- (3) Upon review of the proposed test protocol, the Executive Officer or designee may require additional fuel components, parameters, and specifications to be determined.
- (4) Reference Fuel Specifications. The reference fuel used in the comparative testing described in Section 2710(d) allows the applicant three options in selecting a reference fuel.
  - (A) Option (1). The first option is to use a 10 percent aromatic California diesel reference fuel. The reference fuel must be produced from straight-run California diesel fuel by a hydrodearomatization process and must have the characteristics set forth below under "Reference Fuel Specifications" (the listed ASTM methods are incorporated herein by reference).
  - (B) Option (2). The second option is to make the reference fuel from a custom blend using a "like" California diesel fuel made from a straight-run California diesel fuel by a hydroaromatization process and must have the characteristics set forth below under "Reference Fuel Specifications". In addition the reference fuel must exhibit the bell shaped distillation curve characteristic of diesel fuel and no chemical feedstocks or pure chemicals such as solvents can be used as blend stocks. Details of the source and specifications of the feedstocks must be provided in the protocol and the processes and diesel feedstocks used to make the reference fuel must be reviewed and approved by the Executive Officer.
  - (C) Option (3). For alternative diesel fuels and fuel additives that contain diesel as a base fuel such as emulsified diesel fuel and 80:20 biodiesel fuel (80 percent diesel/20 percent biodiesel), the base diesel fuel used to make the alternative diesel fuel or fuel additive can be used in place of the 10 percent aromatic California diesel reference fuel. The base diesel fuel must be a certified, commercially available diesel fuel sold in California. The sulfur content, aromatic hydrocarbon content, polycyclic aromatic hydrocarbon content, nitrogen content, natural cetane number, API gravity, viscosity, and distillation specifications must be provided for the base diesel fuel used for the reference fuel.

Table 6. Fuel Test Methods and Reference Fuel Specifications

| Property                                  | General Reference Fuel Specifications | ASTM Test Method |
|---|---------------------------------------|------------------|
| Sulfur Content                            | 15 ppm max                            | D5453-93         |
| Aromatic Hydrocarbon content, Vol. %      | 10% max                               | D5186-96         |
| Polycyclic Aromatic Hydrocarbon content % | 1.4% max                              | D5186-96         |
| Nitrogen Content                          | 10 ppm max                            | D4629-96         |
| Natural Cetane Number                     | 48 min                                | D613-84          |
| Gravity, API                              | 33-39                                 | D287-82          |
| Viscosity at 40°, cSt                     | 2.0-4.1                               | D445-83          |
| Flash point, °F                           | 130                                   | D93-80           |
| Distillation, °F                          |                                       | D86-96           |
| IBP                                       | 340-420                               |                  |
| 10%REC                                    | 400-490                               |                  |
| 50%REC                                    | 470-560                               |                  |
| 90%REC                                    | 550-610                               |                  |
| EP  | 580-660                               |                  |

- (5) The identity of the entity proposed to conduct the tests described in Section 2710(d);
  - (6) Reasonably adequate quality assurance and quality control procedures;
  - (7) Notification of any outlier identification and exclusion procedure that will be used, and
  - (8) A demonstration that any procedure meets generally accepted statistical principles.
- (c) Application for Alternative Diesel Fuel and Fuel Additive Emission Reduction Verification. Upon completion of the tests, the applicant may submit an application for verification to the Executive Officer or designee. The application must follow the format in Section 2702(d) as applicable and include:
- (1) The approved test protocol,
  - (2) All of the test data,
  - (3) Copy of the complete test log prepared in accordance with Section 2710(d)(3)(B),
  - (4) A demonstration that the candidate alternative diesel fuel or fuel additive meets the requirements for verification set forth in this section, and
  - (5) Such other information as the Executive Officer or designee may reasonably require.
- (d) Emissions Test Procedures for Particulates, Nitrogen Oxides, Soluble Organic Fraction, Hydrocarbons, and Toxics.
- (1) Criteria pollutants test requirements. In each test of a fuel, exhaust emissions of NO<sub>x</sub>, NO<sub>2</sub> (pursuant to Section 2706(a)(2)), total PM, carbon

monoxide, carbon dioxide, and hydrocarbons must be measured. In addition, for each test the soluble organic fraction (SOF) of the particulate matter in the exhaust emissions must be determined in accordance with the Air Resources Board's "Test Method for Soluble Organic Fraction (SOF) Extraction" dated April 1989, which is incorporated herein by reference.

- (2) Toxic emissions sampling and analysis requirements. Exhaust emissions of formaldehyde, acetaldehyde, benzene, toluene, ethyl benzene, xylenes, butadiene, and polycyclic aromatic hydrocarbons are to be sampled and analyzed as specified in Table 7 for a minimum of three test samples collected from separate emission test repetitions.

Table 7. Toxics sampling and analysis <sup>1,2</sup>

| Toxics   | Method                      |
|--|-----------------------------|
| Formaldehyde and acetaldehyde                          | ARB SOP 104                 |
| Benzene toluene, ethyl benzene, xylenes, and butadiene | ARB SOP 102/103             |
| Polycyclic aromatic hydrocarbons                       | ARB method 429 <sup>3</sup> |

<sup>1</sup>Additional toxics sampling may be required depending on the chemical composition of the additives in the fuel.

<sup>2</sup>At a minimum tunnel blanks are required prior to and after conducting toxic emissions sampling for the reference fuel and candidate alternative diesel fuel or fuel additive.

<sup>3</sup>PAH sampling consists of a filter to collect particulate PAHs and XAD resin to collect volatile PAHs. The sampling protocol needs to be included in the test protocol. Analysis of the samples will be performed by ARB method 429.

- (3) Emission test requirements and test sequence for emissions test program.
- (A) The applicant must follow the emission test requirements from Section 2703 subsections (a), (b), (k), (l), and (m). For all on-road diesel vehicles and equipment, the applicant must conduct engine dynamometer testing using the Federal Test Procedure (FTP) Heavy-duty Transient Cycle, in accordance with the provisions in the Code of Federal Regulations, Title 40, Part 86, Subpart N. For all off-road and stationary diesel vehicles and equipment, the applicant must conduct engine dynamometer testing in accordance with Section 2703(e)(2) and 2703(e)(3). The applicant must use one of the following test sequences:
1. If both cold start and hot start exhaust emission tests are conducted, a minimum of five exhaust emission tests must be performed on the engine with each fuel, using either of the following sequences, where "R" is the reference fuel and "C" is the candidate

alternative diesel fuel or fuel additive: RC CR RC CR RC (and continuing in the same order) or RC RC RC RC RC (and continuing in the same order). The engine mapping procedures and a conditioning transient cycle must be conducted with the reference fuel before each cold start procedure using the reference fuel. The reference cycle used for the candidate alternative diesel fuel or fuel additive must be the same as determined for the reference fuel.

2. If only hot start exhaust emission tests are conducted, one of the following test sequences must be used throughout the testing, where "R" is the reference fuel and "C" is the candidate alternative diesel fuel or fuel additive :

Alternative 1: RC CR RC CR (continuing in the same order for a given calendar day; a minimum of twenty individual exhaust emission tests must be completed with each fuel)

Alternative 2: RR CC RR CC (continuing in the same order for a given calendar day; a minimum of twenty individual exhaust emission tests must be completed with each fuel)

Alternative 3: RRR CCC RRR CCC (continuing in the same order for a given calendar day: a minimum of twenty-one individual exhaust emission tests must be completed with each fuel)

For all alternatives, an equal number of tests must be conducted using the reference fuel and the candidate alternative diesel fuel or fuel additive on any given calendar day. At the beginning of each calendar day, the sequence of testing must begin with the fuel that was tested at the end of the preceding day. The engine mapping procedures and a conditioning transient cycle must be conducted at the beginning of each day for the reference fuel. The reference cycle used for the candidate alternative diesel fuel or fuel additive must be the same as determined for the reference fuel.

3. Alternative test sequence. The applicant may request the Executive Officer to approve an alternative test sequence in place of the above test sequences. In reviewing this request, the Executive Officer may consider all relevant information including, but not limited to, the following:
  - a. Statistical and scientific equivalence to 1. or 2., and
  - b. Body of existing test data using the alternative test sequence.

- (B) The applicant must submit a test schedule to the Executive Officer or designee at least one week prior to commencement of the tests. The test schedule must identify the days on which the tests will be conducted, and must provide for conducting test consecutively without substantial interruptions other than those resulting from the normal

hours of operations at the test facility. The Executive Officer or designee should be permitted to observe any tests. The party conducting the tests must maintain a test log which identifies all tests conducted, all engine mapping procedures, all physical modifications to or operational tests of the engine, all recalibrations or other changes to the test instruments, and all interruptions between tests, and the reason for each interruption. The party conducting the tests or the applicant must notify the Executive Officer or designee by telephone and in writing of any unscheduled interruption resulting in a test delay of 48 hours or more, and the reason for such delay. Prior to restarting the test, the applicant or person conducting the tests must provide the Executive Officer or designee with a revised schedule for the remaining tests. All tests conducted in accordance with the test schedule, other than any test rejected in accordance with an outlier identification and exclusion procedure included in the approved test protocol, must be included in the comparison of emissions.

- (C) Upon approval of the Executive Officer or designee, the applicant may specify an alternative test sequence to Section 2710(d)(3)(A). The applicant must provide the rationale demonstrating that the alternative test sequence better characterizes the average emissions difference between the reference fuel and the alternative diesel fuel or fuel additive.

(e) Durability.

- (1) The applicant must meet the durability demonstration requirements in Section 2704 subsections (a), (b), (d), (e), and (h) with the exceptions of emission testing and fuel requirements. If the applicant's diesel emission control strategy includes hardware components in addition to the alternative diesel fuel or fuel additive, then the emission testing requirements in Section 2704 apply.
- (2) The applicant must provide test data obtained after completion of the service accumulation, described in Section 2704(d), showing that the candidate alternative diesel fuel or fuel additive does not adversely affect the performance and operation of diesel engines or cause premature wear or cause damage to diesel engines. This must include but is not limited to lubricity, corrosion, and damage to engine parts such as fuel injector tips. The applicant must provide data showing under what temperature and conditions the candidate alternative diesel fuel or fuel additive remains stable and usable in California.

- (f) Multimedia Assessment for Fuel Strategies. Diesel emission control strategies which rely on fuel changes either through use of additives or through use of alternative diesel fuels must undergo an evaluation of the multimedia effects. No diesel emission control strategy that relies on the use of an additive or an alternative fuel may be verified unless a multimedia evaluation of the additive or alternative fuel has been conducted and the California Environmental

Policy Council established by Public Resources Code section 71017 has determined that such use will not cause a significant adverse impact on the public health or the environment, pursuant to Health and Safety Code section 43830.8. No person shall sell, offer for sale, supply or offer for supply an alternative fuel or a diesel fuel in California that contains an additive for use in a verified diesel emission control strategy unless such a multimedia evaluation has been conducted and resulted in a determination that use of the alternative fuel or additive will not cause a significant adverse impact on the public health and the environment. The applicant shall bear the expense of conducting the multimedia assessment.

(g) Other Requirements.

- (1) The candidate alternative diesel fuel or fuel additive must be in compliance with applicable federal, state, and local government requirements.
- (2) Applicants planning to market fuel in California must contact and register with the U.S. EPA and the California Dept. of Food and Agriculture. Contacts are listed below.

Office of Transportation and Air Quality  
U.S. EPA Head Quarters  
Ariel Rios Blvd.  
1200 Pennsylvania Ave, N.W.  
Washington DC 20468  
Phone (202) 564-9303

Petroleum Products/Weighmaster Enforcement Branch  
Division of Measurement Standards  
Dept. of Food and Agriculture  
8500 Fruitridge Road, Sacramento CA 95826  
Phone (916) 229-3000

- (3) Additional government agencies such as the California Energy Commission, Area Council of Governments, and Local Air Quality Management Districts may be contacted to facilitate the marketing of alternative diesel fuel in California.

(h) Conditional Verification.

- (1) The Executive Officer may grant a conditional verification for an alternative diesel fuel or fuel additive for off-road or stationary applications only after the conditional verification for on-road application is granted. The Executive Officer may grant a conditional verification for on-road application if the applicant meets the following conditions:
  - (A) The applicant has applied for U.S. EPA registration of the alternative diesel fuel or fuel additive ;

- (B) The U.S. EPA has granted a research and development exemption or otherwise granted permission for the alternative diesel fuel or fuel additive to be used, and;
  - (C) All relevant requirements of Sections 2700-2710 have been met with the exception that registration with the U.S. EPA has not been completed.
  - (D) Multimedia Assessment as specified in Section 2710 (f).
- (2) Where conditional verification is granted, full verification must be obtained by completing the U.S. EPA registration process within a year after receiving conditional verification. During that year, conditional verification is equivalent to verification for the purposes of satisfying the requirements of in-use emission control regulations.
- (i) Extensions of an Existing Verification. See Section 2702 (g). The applicant may request the Executive Officer to approve a reduced number of emission tests when extending an existing verification to other emission control groups. In reviewing this request, the Executive Officer may consider all relevant information including, but not limited to, the following:
- (1) Variability in the test results used for the existing verification,
  - (2) Characteristics of the duty cycles in the other emission control groups,
  - (3) The mechanism by which the alternative diesel fuel or fuel additive reduces emissions, and
  - (4) Body of existing test data.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, 43105, 43600, 43700 and 43830.8 Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107, 43204-43205.5 and 43830.8, Health and Safety Code; Section 71017, Public Resources Code, and Title 17 California Code of Regulations Section 93000.